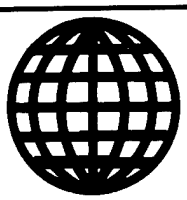
JPRS-EST-90-019
28 SEPTEMBER 1990



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JPRS-EST-90-019 *28 SEPTEMBER 1990*

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Notice to Readers: *Beginning 4 Oct, all articles on S&T developments in the former FRG and GDR will appear in the WEST EUROPE section with the designation "Germany" or "German."*

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SCIENCE & TECHNOLOGY POLICY

ADVANCED MATERIALS

France: Heat-Resistant Glass Foam Developed

90AN0394 Toddington NEW MATERIALS INTERNATIONAL in English Aug 90 p 8

[Article: "Nitrogen Glass Foam Will Resist 1,000 Degrees Celsius"]

[Text] Researchers in nitrogen glasses at the Chemistry of Materials Laboratory in Rennes have come across a form of glass foam which is similar to an expanded material after cooling. Able to withstand high pressure and temperatures up to 1,000 degrees Celsius, the material is claimed to have high resistance to putrefaction and very good thermal insulation properties.

Industrial applications are being developed, particularly in shipbuilding, where a nitrogen glass foam could form the base of a sandwich material. Companies involved include Innomat, a subsidiary of Koalins, and DCAN.

Another result of research at this laboratory is a patented process for making aluminium nitride in a purer form than was previously available in France. The material is used as a substrate for hybrid circuits where good heat conduction and electrical insulation is important. Compared with aluminium oxide, the material currently employed, aluminium nitride is 10 times more thermally conductive.

The process developed by the Rennes laboratory involves the reaction of ammonia gas on aluminium oxide powder at 1,200-1,300 degrees Celsius, the result of which is aluminium nitride and water. In France, aluminium nitride is normally prepared by the carbonitration of aluminium oxide, which leaves behind a trace of carbon.

The Rennes product is higly reactive to sintering and, at 1,800 degrees Celsius, achieves a theoretical density of 96 percent after sintering while other products on the market achieve only 66 percent in the same conditions.

The same process can be used to make nitrides of other compounds, such as titanium, for such applications as cutting tools.

AEROSPACE, CIVIL AVIATION

ESA Approves Satellite Programs

90MI0312 Rome AIR PRESS in Italian 18 Jul 90 p 1745

[Text] The board of directors of the ESA (European Space Agency) has approved the ARTEMIS (Advanced Relay and Technology Mission Satellite) and DRS (Data Relay System) programs in which Selenia Spazio is the prime contractor. The Italian government has become the principal financier of both programs, having acquired a 45 percent share in each. The other nations taking part in ARTEMIS and DRS are Austria, Belgium, France, the UK, Canada, the Netherlands, Spain, Sweden, and Switzerland.

ARTEMIS, which will be launched in 1994 with an Ariane-4 from the Kourou launch site, will carry three payloads to demonstrate new technologies and services: a laser band optical TLC [telecommunications] package for high-speed data transmission between satellites in low orbit using future data relay systems; a multiple-access, S-band TLC package to prepare for future DRS's, and an L-band moving load to demonstrate services between European terrestrial vehicles.

The DRS will be launched in 1996 with an Ariane-4 as well and will include a space segment and a ground segment for communications between the earth and space vehicles such as the Columbus free flyer module, which is part of the ESA's international space station, the Hermes shuttle, and the polar platform. The ESA council also approved a four-year extension of the ASTP (Advanced Systems and Technology Program) which will focus on the medium-and long-term research and development of advanced satellite and telematic technologies.

ESA Approves Three Communications Satellite Projects

90MI0332 Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN in German 15 Aug 90 pp 13-14

[Text] The ESA [European Space Agency] Council adopted three new major programs in the field of advanced communications satellite systems in late July.

ARTEMIS (Advanced Relay and Technology Mission Satellite) will carry three experimental payloads to demonstrate new technologies and services:

- A laser-optical communications payload for high transmission rate data links with satellites in near-earth orbit within future data relay systems;
- A high performance payload in the S-band with multiple access, to prepare the way for the operational data relay system;
- An L-band payload for mobile ground radio communications to demonstrate satellite communications services for European ground vehicles.

The Artemis geostationary satellite platform will present substantial improvements in design, thus making it possible to launch greater payloads, provided the satellite mass does not exceed half the capacity of Ariane-4. The DRS (data relay system) will comprise a space and ground infrastructure and be used in communications between users such as the free-flying Columbus Laboratory, which is part of ESA's contribution to the international space station, the Hermes spacecraft, the polar platform, and the ground. The decision on the development phase of this program will be taken late in 1991.

Artemis will be launched in 1994, and the DRS in 1996, with an Ariane-4 rocket from Kourou in French Guiana. Selenia Spazio in Rome is the main contractor for the Artemis and DRS programs. The Italian Government is making the largest contributions (45 percent) to both programs. Belgium, France, the Netherlands, Austria, Sweden, Switzerland, Spain, Great Britain, and Canada have also promised to participate in the programs. Finally, the Council also decided to extend by four years the Advanced Systems and Technologies Program (ASTP), the purpose of which is medium- and long-term research and development on advanced satellite technologies and satellite telematics.

Over the past 10 years ESA has made a decisive contribution to the creation of two great satellite operating organizations: Eutelsat, which operates the ECS [European Communications Satellite] television and telephone satellites developed by ESA, and Inmarsat, which uses the ESA-developed Marecs satellites in its worldwide marine radio system. With Olympus, the largest experimental communications satellite, which designed to demonstrate new European technologies and services and was launched in 1989, ESA confirmed its reputation as a successful promoter of the European communications satellite industry. Artemis and DRS will further consolidate this reputation in the next 10 years and more.

ESA regards these new programs as a significant contribution to the development of new telecommunications facilities and services, the market for which is rapidly expanding worldwide.

Aerospatiale Developments Reviewed

Flexible Manufacturing at Meaulte

90WS0057A Paris INDUSTRIES & TECHNIQUES in French 18 May 90 p 84

[Article by Alain Perez: "Aerospatiale Changes Gears"; first paragraph is INDUSTRIES & TECHNIQUES introduction]

[Text] In response to the five-fold increase in Airbus production, the aeronautics industry is changing over to flexible manufacturing. In Meaulte, the first in a series of five flexible machining shops is being implemented.

Soon it will be one Airbus a day. Rationalization, specialization and flexibility head the agenda at Aerospatiale's Aircraft Division. With the arrival of the A330/340, Airbus Industrie EIG [Economic Interest Group] production will be approaching 200 aircraft a year. "This is a change in scale. The pace is going to increase by a factor of five or six," according to Aircraft Division production manager Daniel Huet. To keep up with this pace, Meaulte, the most discreet of the Aerospatiale plants, is getting ready for a historic change. During the 1930's, they assembled two Potezes a day on the Picardy plain. Today, Meaulte manufactures Airbus subunits and mechanical components.

Massive production investments—almost 70 million francs for the Meaulte unit alone—are bringing change in three areas: shorter production cycles, industrial reorganization, and a new subcontracting policy. "From now on, we will be competing with other plants in France and Europe. We need to know the individual cost price of each part. All these economic indicators are common knowledge in the production shop," according to plant manager Jacques Crusson, who has opted for openness with the employees.

Floreal 1 is the first of five flexible shops planned for Meaulte. Designed to machine mechanical components made of lightweight alloys, it will be totally operational in June.

Riveting of Fuselage Pieces Soon To Be Automated

The shop has the classic equipment: three five-axis digitally controlled machining centers, robotized tool loading, a rail-mounted shuttle for parts transport, and a MicroVax 2 for computer control. The entire installation (33.5 million francs) allows flexible manufacturing of 70 different components at the rate of 5,000 parts a year. The Floreal 1 will cut production cycles from eight weeks to under three weeks. Part production start-up time has also been halved. "Just-in-time manufacture was a priority goal. The plant operates year round, 24 hours a day. At night, it runs on automatic, with only one supervising employee. We knew that we would achieve significant gains, but not to this extent," Jacques Crusson said with visible pride in his new tool. "We expect an 8-million-franc-per-year increase in productivity. The investment will pay for itself in four years."

Eventually, the plant is expected to process 320,000 mechanical parts a year, divided among 44 technological families. Of this total, 21 families (130,000 parts a year) will be contracted out in their entirety. The rest (basically parts with a large added-value component) will be manufactured exclusively at Meaulte. For reasons of productivity, a few overly conventional jobs will be abandoned to specialized subcontractors. "Turning is no longer within our province. We are no longer competitive with the big plants in this sector. We are only keeping 10 percent of our work in this area, for vital parts, in order not to lose the knack," Jacques Crusson said.

Next year, a second flexible mechanical shop (Floreal 2) will be set up for the simplest parts (3 axes). Floreal 3 (4 axes) is scheduled for 1992. Automated riveting of fuselage pieces will be introduced at the same time. The technology is ready, but a delicate problem remains to be solved. "We now see that the stumbling block is in the administrative cycle. This is the real scourge of large-scale operations," Daniel Huet concluded.

Saint-Nazaire Automated Warehouse

90WS0057B Paris L'USINE NOUVELLE in French 7 Jun 90 p 76

[Article by Odile Esposito: "New Ideas for Automatic Warehousing"; first paragraph is L'USINE NOUVELLE introduction]

[Text] Aerospatiale has just created the model warehouse. The secret is extremely detailed real-time simulation of the entire installation.

Heavy 3-ton stock transporters position themselves with 1 millimeter accuracy after having traveled 13 meters. The automated warehouse of which Aerospatiale's Saint-Nazaire facility took delivery yesterday will probably be considered a model. Accuracy of movement is very important here. The objects handled and stored, which move through over 4,000 bins, are Airbus and hardware components destined for the aircraft section assembly shop. The slightest jolt can send them directly to the scrap heap.

Aerospatiale invested three years of study and some 15 million francs in this warehouse. Understandably, it wanted to take its time. The software service firm Eurosoft Systemes (240 employees, income of 106 million francs) was responsible for the software portion of this delicate installation. When asked whether Eurosoft Systemes was an automated warehousing specialist, Nantes branch manager Alain Boulicot replied, "This has been our first effort in the field. But that enabled us to take a fresh approach to the problem."

Eurosoft engineers decided that the first priority was to develop an extremely detailed simulation of the future installation. They took every parameter into consideration: not just part entry and exit flow and operator wait times, but the specifications for each mechanical device as well (weight, shuttle and stock transporter travel speeds, acceleration, etc.).

This simulation showed that the best results in terms of volume and pace were obtained by placing the eight operators at either end of each of the four stock transporters. There is no reserved location for each part type. Two central computers (a MicroVax 3100 and 2000) constantly track the address of each part. These computers and two DEC servers control the entire installation. The six April 5000 automats are limited to executing simple commands, which avoids saturation.

This application makes a clear distinction between three functions: mechanics, automation, and data processing. Is this the secret of success?

Ceramic Composites for Hermes

90WS0057C Paris L'USINE NOUVELLE in French 31 May 90 pp 60-61

[Article by Pierre Laperrousaz: "Ceramic Composites Leave Research and Development"; first paragraph is L'USINE NOUVELLE introduction]

[Text] Whether a proponent of carbon-carbon composites or silicon-carbide-based ceramic composites, each of the participants in the Hermes program—Aerospatiale and SEP—has its preferred technology and expects to find industrial applications.

There are only eight years to go until the first flight of the Hermes European space shuttle, which gives the engineers at Aerospatiale and SEP (European Propulsion Company) little time to develop materials that can stand the very high temperatures generated by the spacecraft's reentry into the atmosphere: 1,900°C at the nose and up to 1,700°C on the leading edges of the wings.

"We have until the end of the year to demonstrate the validity of our processes," in the words of Jean-Francois Jamet, who heads the new materials department at Aerospatiale. However, in Saint-Medard-en-Jalles (near Bordeaux) and, not far away, in Haillan, SEP was confident. Construction is already under way on four ovens capable of holding the largest of the shuttle components, such as the nose, the vertical stabilizer, or the elevons. For 25 million francs, SEP now has the biggest CVD (Chemical Vapor Deposition) oven in the world: 2.8 meters high and 2.5 meters in diameter, with around 1 megawatt of power. It will be fully operational by the end of the year. "In the 1975, the biggest part we could make was barely the size of a fingernail," SEP materials department head Francois Christin said. Aerospatiale plans to have its "big" oven (2.7 x 2.7) in operation in 1991.

With Aerospatiale using oxidation-protected carbon-carbon (C-C) composites and SEP, silicon-carbide-based (SiC-SiC) ceramic composites, each of the participants in the Hermes materials program has its preferred technology. This preference determines their roles in the shuttle structure. Only C-C composites, which are made up of carbon fibers embedded in a carbon matrix, can withstand the temperatures to which the nose and leading edges will be subject. To do so, however, they must be kept from oxidizing, because at these temperatures, carbon is all too prone to burn. Aerospatiale engineers can already offer a variety of solutions, depending on the temperature level.

For the leading edges, which will barely exceed 1,500 to 1,600°C, oxidation protection will consist of a layer of silicon carbide a few microns thick, itself "healed" to a layer of silica. "Tests have shown that parts with this kind of protection suffer a weight loss of only 1 percent after 30 minutes at 1,500°C," Jean-Francois Jamet said. The nose of the shuttle, which will reach almost 2,000°C during a part of atmospheric reentry, calls for more sophisticated antioxidation protection. Aerospatiale has developed a system of three superimposed layers of silicon carbide, aluminum nitride, and alumina, which appears satisfactory. "The first reentry simulation tests had to be cut short. The silicon-carbide sample stands did not hold up long enough!"

In opting for SiC-SiC components with a silicon-carbon matrix strengthened with silicon-carbon fiber, SEP has limited itself to lower temperature applications. Its materials can barely exceed 1,600 to 1,700°C, which is why the CNES [National Space Studies Center] chose carbon-carbon instead, even for the leading edges. However, since SiC-SiC composites are intrinsically non-oxidizable, they do not need protection. As a result, SEP will manufacture the shuttle elevons, which are located on the trailing edge of the wings and are not subject to high temperatures, as well as various other fuselage and wing panels. The two companies also differ in their manufacturing processes. SEP champions gas-process densification, with the CVD process. This process consists of gradually depositing silicon carbide onto the reinforcement fibers through thermal decomposition (1,000°C) of a precursor gas that provides the carbon and the silicon. The temperature and composition of the gas must be as even as possible, which is no small feat in a oven the size of the one in Haillan. "Still, variations do not exceed 10°C," Francois Christin said. The problem with CVD is that the production cycles take weeks.

That is why the liquid process, which consists of bringing the material into the matrix in its more concentrated, liquid state, has its supporters. "This is probably the better solution if you want ceramic composites to lead eventually to wider applications," according to Paul Costa, who is scientific director of materials for ONERA [National Office for Aerospace Studies and Research], which works with Aerospatiale. The Bordeaux laboratories are researching a densification method that combines infiltration of superfine ceramic powders and injection of a liquid precursor that is then pyrolyzed. "Densifying a part would only take a few days," Jean-Francois Jamet said. Using "liquid" techniques, Aerospatiale is also working on SiC-strengthened ceramic matrix composites capable of withstanding up to 1,000°C for long periods and a maximum of 1,200°C.

There is no doubt that the Hermes shuttle will provide a fantastic springboard for thermostructural ceramics. However, the manufacturers are not waiting for its first flight to seek out other applications. Carbon-carbons are on their way to widespread use in aircraft brakes (SEP manufactures 100 metric tons of them a year). SiC-SiC's are already "flying" in the cold valves of the M88 jet engine that will equip the Rafale while awaiting the hot valves (1,000°C), to be tested in 1991. Both Aerospatiale and SEP expect that many other applications will be found as manufacturing techniques improve and prices drop.

FRG, GDR Joint Aerospace Projects Discussed

90MI0274 Bonn WISSENSCHAFT, WIRTSCHAFT, POLITIK in German 30 May 90 p 5

[Text] Eastern cosmonauts and western astronauts will work more closely together in the future. This is one of the goals of pan-German cooperation on space research, on which the seal was set with an agreement between the German Aerospace Research Institute (DLR) and the GDR Academy of Sciences' Institute of Cosmological Research (IKF) at the end of April. Both institutes are endeavoring to make the bond as close as possible, taking account of the current political, technical, material, and structural situations and their further development. In particular, the DLR and the IKF intend to work together on earth observation and environmental surveying, space research and engineering, and manned space flights.

This cooperation should improve both institutes' efficiency in a complementary fashion. For example, the IKF can contribute its experience in developing flight hardware and the DLR, its data systems engineering know-how. In addition, both institutes will bring their specific experience in international space cooperation to bear on this joint work, and each will assist the other in gaining access to its current cooperation partners.

Environmental surveying, planetary research, and manned space missions are among the projects planned between Cologne and East Berlin.

Remote sensing data on special environmental issues in the FRG and the GDR will be acquired and assessed in the course of the remote sensing work. The data acquired will be fed into the DLR's environment data base. As part of the Mars 94 project, the partners intend to undertake the joint development of a camera system for the 1994 Soviet mission. They will share the work of developing the necessary components to avoid duplication and save costs. This work will constitute the first step in a joint program on the development of optoelectronic systems for earth observation and planetary research.

The IKF's experience of manned space missions with the Soviet Union will be turned to account in the preparation for a DLR astronaut's participation in the Soviet MIR station flight in 1992. Both institutes want to promote reciprocal exchanges among personnel (visiting scientists, doctoral students, and management) in the future. Both sides have agreed on joint activities at the International Space Conference to be held in Dresden in 1990, as an international sign of their future cooperation.

FRG, USSR Initiate Joint Research Program

90MI0319 Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN in German 27 Jul 90 pp 7-8

[Text] An exchange of letters has brought into force the agreement concluded on 25 October 1988 between the BMFT [FRG Ministry of Research and Technology] and the USSR Academy of Sciences on scientific and technical cooperation in the exploration and exploitation of space for peaceful purposes. The agreement has an initial five-year term.

The first cooperation program comprises a long list of joint research projects. They continue the joint extraterrestrial basic research projects on which the FRG Research Association, Max Planck Society institutes, and the Soviet Academy of Sciences have been working for several years, successes including the investigation of Halley's comet and high-energy X-ray experiments aboard the MIR space station. Research into the relationship between the sun and the earth, the solar system, the planets, comets, space astronomy, and astrophysics will be to the fore in the future. Joint atmospheric research and earth observation projects from space and the joint implementation of a high-altitude research rocket program will also gain increasing importance. Then there are microgravity research and space biology and medicine (exchanges of information about manned space missions, gravitation biology in plants, etc.).

A key project under the first cooperation program is an FRG astronaut's mission aboard the Soviet space station MIR in the first half of 1992. The FRG Aerospace Research Institute (DLR) concluded the requisite agreement with the Soviet organizations Licensintorg and Energia in May. The five-strong German astronaut team is currently at the Gagaring Training Center near Moscow to get to know these organizations. A team of Soviet physicians had previously begun medical tests on these mission candidates in Cologne-Porz. The two candidates, male and female, who will actually be trained for the space mission, will be selected in the two months.

A German Space Agency (DARA) delegation is also visiting the Gagarin Training Center to coordinate the joint scientific experiments that the German astronauts and their Soviet colleagues will carry out aboard the space station. It has been agreed that the German astronaut, who will spend about 5 days aboard MIR, will have with him 100 kg of scientific payload. The scientific experiments will primarily involve the life sciences in general and medicine in particular. The adaptation of the circulation and biorhythms to microgravity is one of the topics scheduled for study. FRG scientists expect to add to the experience gained with the Spacelab missions such as the first German mission D1 with additional important findings both in basic research and regarding the astronauts' onboard behavior under microgravity conditions.

MBB AI Satellite Described

90MI0317X Munich MBB NEW-TECH NEWS in English No 1, 90 pp 17-21

[Excerpts] In the course of the past years, MBB has worked out a series of technologically valuable facts and findings, part of which are protected by internationally valid patents, which will assist in the installation of this type of earth-observation system. The term earth observation here does not only represent optical activities. It above all signifies computers performing optoelectronic-digital-mathematic work from a geostationary orbit at an altitude of 36,000 kilometers.

The system that can make all this happen is called LESAT (Learning Remote-Sensing Satellite System). It contains a research approach with a view to a long-living, error-tolerant, multisensor environmental measuring and evaluation system which can detect and learn, and is based in space. The satellite system comprises three basic functions: four geostationary satellite centers with artificial intelligence (AI), two reconnaissance satellites that circle the earth in polar orbit, and tank-satellite modules parked in orbit.

The satellite observation system's operation is all-earth-encompassing, which means that the satellites simultaneously "acquire" the earth's picture from all sides. One glance and the entire earth becomes visible, enabling detailed scientific evaluations to be made of its surface and atmosphere. The system would look something like this: Four geostationary AI satellite centers are arranged in the geostationary orbit in such a manner that they can optically survey the entire surface of the earth with the exception of the zones near the poles. The four AI satellite centers, equipped with the appropriate measuring sensors, are linked by a ringbus-laser communication unit. Via this laser-communication unit the four satellite centers continually exchange data acquired on the status of the earth's surface in the night and day areas.

On earth, various users can call up data from the nearest center in the geostationary orbit (altitude 36,000 kilometers) via microwave radio and satellite antennae. From a low orbit (altitude 300 to 400 kilometers) two additional reconnaissance satellites that circle around the poles provide the AI satellite centers with optically and sensorially acquired high-resolution measurement data by means of a radio data link.

The pole satellites work like tracking hounds on a data base line in orbit. Depending on the monitoring status in the AI centers, they provide information in cases of sudden changes on earth's surface by means of high-resolution picture-data and measurement-data acquisition. This information would cover , for example, developments in the weather, volcanic eruptions, earthquakes, seaquakes, solar effects, cosmic radiation, or other events on earth that are subject to rapid fluctuation. If the fuel reserves for the satellites' attitude-control or propulsion-control engines run out, there is a parked, remote-controlled tank satellite in orbit that can supply the satellites with new fuel by means of its own propulsion and a special navigation and docking system.

A geostationary AI satellite-center consist of a processor network as was described in the new-tech news 4-88 issue under the designation of OPTICOM. A processor network of this kind consists of single-level; rows of integrated microprocessor chips in a hexagonal* metal grid system.

Their energy comes from solar cells on the lower side of the chip, and they communicate with one another via an optical-fiber system on the upper side of chip. An optical

permanent hard-disc memory, which is linked to the processor network, contains all the operational programs needed for the network's basic functions and keeps them available at all times.

The term processor network represents the interlinking of a multitude of microprocessors by means of its own communications system. Similar to a fishing net, this system comprises nodes and meshes, where the nodes are the crossover points on which the microprocessors are positioned - hence the interfaces of a multitude of information - and the meshes are the transmission paths for the information. This communications system has the advantage that individual microprocessors in the nodes and meshes may be impeded or destroyed without substantially inhibiting the overall function. The so-called redundancy is thus multiply safeguarded.

For memorizing function data such as digitized picture data for pattern memory and detection from the camera's systems, and erasable writing/reading memory in connection with the processor network. Consequently, the satellite center's brain takes on the form of capsulated network processors that are protected from foreign and hindering influences. The geostationary AI satellite center performs the following tasks in the overall system:

One mission is optical surface monitoring, such as global or large-area weather observation. To perform this task there is a camera system based on high-resolution CCD chips with various exchangeable color filters and a variable objective that operates in the visible light range. A video-image processor component transmits the camera data for evaluation to the processor network - a procedure that is effectuated via fiber-optical data bus.

The following process is utilized for the optical analysis of the light spectrum emanated from the earth's surface in the masked range of day and night reflecting light: An optical spectrum-analysis sensor takes on the task of effectuating direct, sectorized spectral analysis of the composition of substances in the layer of air surrounding the earth. A spectral processor chosen for this purpose translates the acquired data for the processor network.

An infrared map of the earth's surface is generated by the earth- observation system as follows: A laser scanner operating in the low infrared range, which penetrates the clouds, scans the earth's ocean and land areas using code-marked detection signals and measures the return loss on the earth's surface in the land,. ocean, and ice areas. A laser processor acquires the data and transforms them for the central processor network.

A special microwave receiver monitors the radio waves in the microwave range which are emanated from the earth's surface. A connected microwave processor transmits the transformed data to the processor network for further processing.

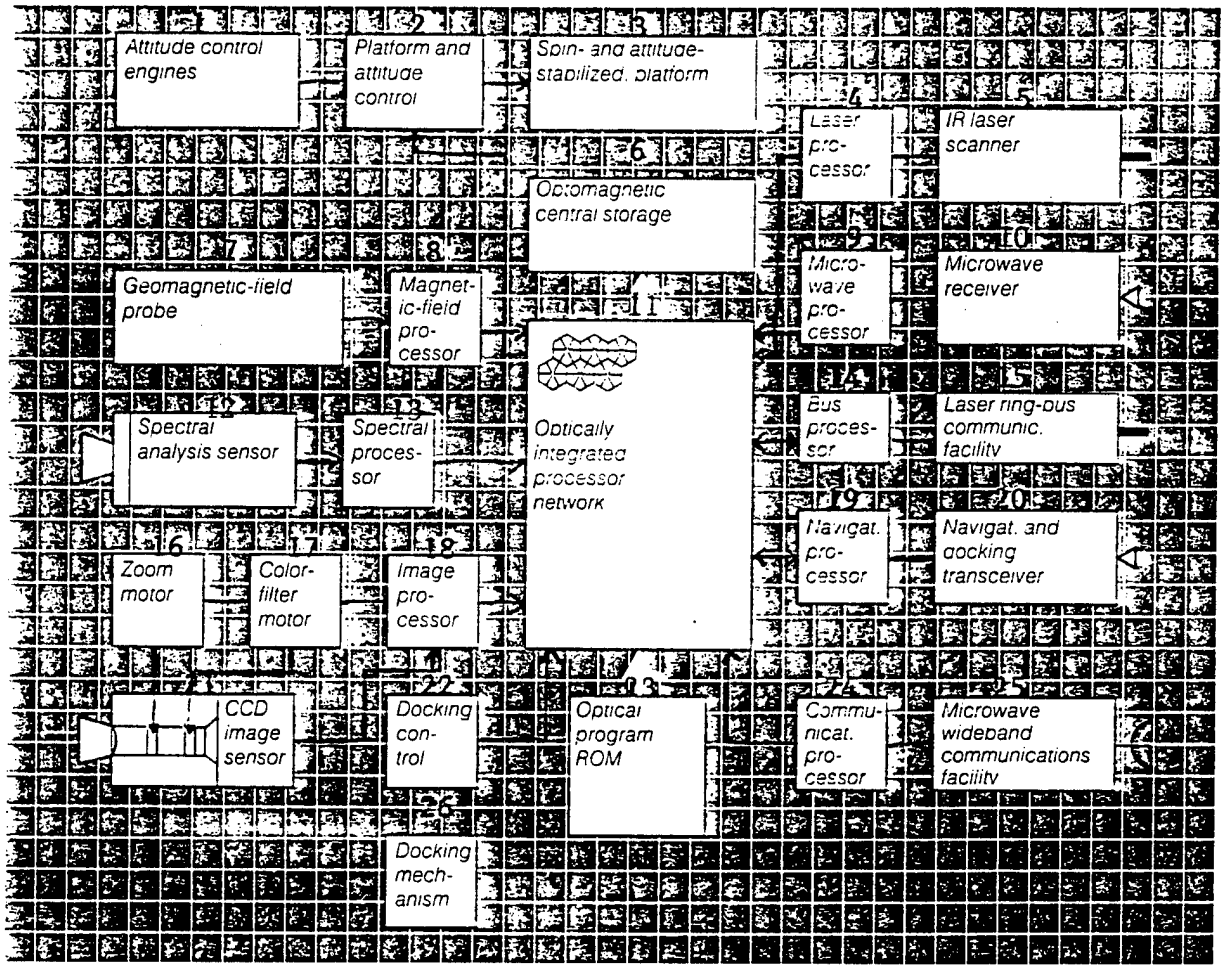
A geomagnetic field probe measures the external geomagnetic field in connection with the particle flow (solar wind) coming from the sun. This probe continually supplies data on fluctuations in the geomatic field in direction, force, and polarity. These data, too, are processed via a processor component chosen for this purpose and transmitted to the central processor network. This provides information on the relation between the ozone concentration in the upper ionosphere layer and the recently increasing hole sin the ozone on the one hand, and the geomatic disturbances of these processes on the other hand. The spreading of the ozone holes influences the penetrability of UV rays into the atmosphere, which disturbs and modifies the energy balance in the atmosphere and on earth.

A laser ringbus communications system, consisting of a bus processor system linked up to the processor network and a laser transmitter/receiver unit, is foreseen for the communication between the four AI satellite centers. The system will link all four satellite centers across the distance in space for the purpose of data exchange. A special wideband communication system, which is in contact with the earth's surface, will allow users of the system on the earth to gain access to the data and evaluations in the AI satellite centers.

Via an attitude control, which is coupled with the processor network, the date from the laser-based attitude platform inside the satellite are utilized by the processor network to activate the spin and attitude engines (spin and stabilization engines). This allows the satellite center to maintain a stable attitude and position in relation to the earth's surface via optical star positioning as well as laser gyro. A special docking control with the accompanying mechanical systems effectuates the coupling of tank satellites in case the fuel reserves on board run out. To do this, the arriving tank satellite is actively guided to the docking position by a microwave-navigation-and docking transceiver.

As is the case in the OPTICOM system, the electric energy supply for the processor network consists of a baseline layer of solar cells with the processor network positioned behind them. And the solar cells required for the communications and sensor components are designed as a baseline layer for the highspell-frequency generator chips, modulator and amplifier chips, as well as for the sensor chips and the accompanying processor chips. all of which are positioned behind the layer. The results is a multiredundant network system, in which, for example, certain solar cells and chips can be destroyed by meteorites, but the system's overall functioning cannot be reduced. If individual network components have been disturbed or destroyed, the processor network has special testing programs that determine which components no longer function, and they are then eliminated from the system's operation.

The reconnaissance satellite that circulates around the poles performs the following tasks within the overall system. It traces high-resolution, optical details from a near-earth orbit in the visible, near ultraviolet and infrared range of the light spectrum. This job is also performed by a camera system with a variable objective



based on high-resolution CCD chips charge-coupled device chips) with required changeable color and polarity filters. Sudden changes in the optical range can be recorded in enlarged detail by day as well as by night.

Microwave radar provides other complementary monitoring, independent of weather and clouds, of high-resolution details on the earth's surface in land and ice areas as well as of swell and current in the oceans. It supplies structured detailed pictures of the earth's surface, representing a rapid completion of the information from the optical range.

Individual and cumulative color sector partial images in parallel screening record integral changes in color and spectral temperature changes in the atmosphere and on the earth's surface. An integrated camera network with a solid-state design, based on the principle of an insect's eye and equipped with permanent color filters, supplies the various sectorized cumulative color signals, which can then be evaluated together or individually. The thermal reflections, which are important for the complete assessment of the earth's surface. are measured at a low orbit. A thermal imaging camera registers the thermal radiation in the near-earth orbital range and distinguishes various temperature-zone details on the earth's surface.

All collected data are, as with the AI satellite networks, transmitted to a processor network, which is linked up to an optical permanent memory component and an optomagnetic central memory. The processor system also controls the satellite propulsion and the attitude control, as well as the docking process when tanking satellites effectuate the refueling tasks. Furthermore, a laser radio data link provides continuous communication between the pole-circling satellites and the AI satellite centers. By this means they receive mission commands concerning detail reconnaissance for the completion or compensation of data with the AI satellite centers. As for the AI satellite centers, they can, thanks to the basis of global knowledge they possess of the overall correlation they have acquired, create special monitoring tasks for the reconnaissance satellites' orbital phase.

The optical solid-state camera network, as it is called, operates in its schematic design as follows. A multilayer image processor chip, and LCD aperture control, the

solar cell energy supply and the accompanying optical fiber communications network level, along with the CCD matrix image sensor all form a closed optical unit. The chip unit can be arranged side by side on this level, allowing an optical network arrangement to be made. The arrangement, which is similar to the eye of an insect, can individually and jointly supply optically filtered and spectrally different individual and cumulative color signals.

Long-term application of the overall satellite system makes tank satellites a necessity. A tank satellite basically comprises a central storage tank for the satellite's fuel, a main propulsion, the attitude engines, and the docking and navigation equipment. A microwave communications system links the tank satellite with the AI satellite centers, Shuttle or carrier launcher systems park it in orbit, after which it is available at all times to the individual satellites for refueling. With this, the remote-sensing satellite system is guarantied a long life of service.

Thanks to its interlinked computer structure and its extraordinarily high amount of optical memory capacity, the LESAT remote-sensing satellite system can, in the AI satellite centers, use intelligent pattern detection program systems to compile long, comparative and correlative collections of data. This collection does not only consist of statistical mathematical data concerning change parameters of climate and environmental developments in the earth's surface. Thanks to the system's monitoring of critical transgressions in trends and limits. it can also effectuate detailed studies via the pole-circling reconnaissance satellites. which register locally limited developments.

The system's wideband communication equipment, which operates on numerous parallel channels, makes the satellite system available to a great number of different users throughout the world. In addition to the acquisition of standard data, a standardized communications software program makes it possible to define and prescribe continually new applications for the satellite centers. This enables the AI centers to acquire new correlations, primarily from the comparative data coming from the earth, and to critically accompany the development of our planet.

In researching this innovative remote-sensing satellite system, MBB is contributing to world-wide environmental data acquisition and the active reconnaissance of climatic correlations. Long-term development and vegetation damages can also be registered and signalized, and prognoses concerning,. for example, the harvest situation throughout the world, can be effectuated. Data of this kind are also complemented by co-linked weather analyses and prognoses. With the comprehensive concept of the LESAT remote-sensing satellite system, MBB has not only paved the way to increasing the knowledge of our planet, to better recognize and prevent its dangers, but also to correctly assess the earth's biological and economical effectivity.

Italian, UK Precision Casting Company Established

90MI0314 Rome AIR PRESS in Italian 1 Aug 90 p 1871

[Text] Aeritalia, Alfa Romeo Avio (IRI [Institute for the Reconstruction of Industry]-Finmeccanica group), and Rolls-Royce have established EMA (European Aerospace Precision Casting), a new European company specialized in aircraft engines. The three companies each hold a one-third share in EMA. The new EMA plant, to be built at Morra De Sanctis in the province of Avellino, will manufacture precision components using precision casting technology. This will permit extremely high quality castings with complex forms and low tolerance levels to be produced for aerospace applications. Initially, the plant will work for the principal European aerospace programs, both civilian and military including Tornado and EFA [European Fighter Aircraft]. The first precision castings are scheduled for June 1992 and will include the most recent developments of single crystal or directional crystal equal-axis blades.

The establishment of the EMA will permit the Italian aerospace industry to insert itself in the sector of precision castings for aircraft engines, which the country currently imports, by creating an independent production capability. According to a note: "This is even more important in view of the entry into the market of a new generation of engines where the use of precision cast parts that require less machine work will be more widespread. As far as commercial prospects are concerned," continues the statement, "the presence of the British partner, who controls a significant portion of the world aircraft engine market, guarantees the success of the new Italian-British product.

Italy: Implications of Aeritalia, Selenia Merger Discussed

90MI0258 Rome SPAZIO INFORMAZIONI in Italian 23-30 May 90 p 2-3

[Text] Specialized Italian circles were certainly not surprised by the recent announcement that the boards of directors of Finmeccanica, Aeritalia, and Selenia had decided to merge Aeritalia and Selenia by the end of the year. As SPAZIO INFORMAZIONI had noted as early as November 1989, an initiative of this kind by IRI's [Institute for the Reconstruction of Industry] financial holding has long been expected, at least to face the competition in 1993 from similar industrial colossi already operating in countries such as France, the FRG, and the UK.

Finmeccanica's press release on this occasion stated: "The integration of Aeritalia's and Selenia's resources into a single company will permit the coordinated management of common activities (aeronautics, space, defense electronics) and the development of existing technological links." At issue now is this "coordinated

management" of the space sector, which includes the specific expertise of Aeritalia's Space Systems Group, Selenia, Spazio, Laben, Fiar, and Proel Tecnologie, without, however, neglecting shareholdings in companies and consortiums such as Space Software Italia, Carlo Gavazzi Space, CIRA (Italian Aerospace Research Center), MARS (Microgravity Advanced Research and User Support Center), Italspazio, and Elettronica. According to well-informed sources, Finmeccanica has not yet made a final decision, even though various alternatives have already been taken into consideration. For instance, several ad hoc divisions of the new Aeritalia-Selenia company could be created, leading to the establishment of one large "Space Division" that would be entrusted with the management of all activities in this sector. Another alternative would be to group all the personnel, resources, and plants involved in space programs under Selenia Spazio. In this way, the company would formally become the only one dealing exclusively with space activities under the program. Consequently, its involvement in the management of activities in this specific sector would be understandable. Even if the above are only hypotheses, the final outcome will still remain as follows: As of 1991, Italy's space sector will be able to present itself to Europe and the rest of the world as a single, complex public industry which will be highly competitive at both the technological and managerial level.

Engineer Cereti's Opinion

Since the official announcement of the merger, no comment has been made on how the space sector will be organized in the new Aeritalia- Selenia company. However, in an interview published this month in the monthly AVIAZIONE magazine, which undoubtedly took place several weeks before Finmeccanica's announcement, Aeritalia's managing director, Eng. Fausto Cereti, expressed his opinion on this matter. The following is a word by word quote from the interview: "Space can mean putting spacecraft into orbit, which Aeritalia does, but it can also mean the business of space telecommunications. The telecommunications satellites business is very different from the aerospace business; in fact, British Aerospace has not included space telecommunications in its aerospace sector. Earth stations, not satellites, are important for telecommunications satellites. Selenia Spazio's business is rather different from Aeritala's. We are involved in the space sector because we feel that there is no fixed boundary between air and space vehicles. Sooner or later aircraft will be capable of flying both in the atmosphere and above it, and we intend to consider both aspects for these aircraft (Hotol, Sanger, Hermes), and not minisatellites, which, in our opinion, are accessories just like aircraft wing tanks. They are not closely related to the aerospace sector, and we are an aircraft factory that branches out to space activities. This does not mean that in the future I may not be involved with Selenia Spazio. However, if I do become involved, I would consider it a diversification, and not necessarily a repositioning." Referring to Selenia Spazio's possible transfer to Aeritalia, Eng. Cereti ended by saying: "If Finmeccanica does so, it would be to have as complete a ranage of activities as possible. We, however, are aerospace people, not telephone people, or rather telephone relays."

Italy: Aeritalia's Managing Director on EFA Program

90MI0267 Milan ITALIA OGGI in Italian 21 Jun 90 p 45

[Interview with Fausto Cereti, managing director and vice president of Aeritalia; date and place not specified: "The Commander Wishes EFA A Good Trip"; first paragraph is ITALIA OGGI introduction]

[Text] The EFA [European Fighter Aircraft] project must continue because it would be impossible to do without an aircraft of this kind and because it would be uneconomical to halt it now. This, briefly, is Aeritalia's position on one of the most sophisticated potential "victims" of the new international situation. What is the future of the new European superfighter? The EFA, a single-seat, two-jet defense aircraft that should be in service within 18 months, is to be manufactured by the Eurofighter consortium, established in June 1986 by Aeritalia, the FRG's MBB [Messerschmitt Boelkow Blohm], the UK's Aerospace, and Spain's CASA [Construcciones Aeronauticas S.A.]. But will its development be completed? To determine the status of the project, ITALIA OGGI interviewed Aeritalia's managing director and vice president, Fausto Cereti. This Italian company is responsible for the control systems of the general on-board services (hydraulic system, fuel, landing gear), the development of half the left wing, and, together with CASA, is constructing the rear section of the fuselage.

ITALIA OGGI: "What future does the EFA program have in an international setting in which "peace has broken out?"

F. Cereti: Rather than peace breaking out, let us say that the localized tension has ended. Over the last 40 years this oriented all military programs toward a well-known threat and a single possible type of conflict of apocalyptic dimensions. This led to the development of many specialized weapons for a scenario that fortunately now seems to be outdated. However, the EFA has an entirely unique role in this panorama.

ITALIA OGGI: Why do you think that the European superfighter is a case apart?

F. Cereti: It is a defense aircraft; in other words, a fighter designed to patrol its own airspace. Such a system may be more or less sophisticated, may require a greater or lesser number of aircraft, but this function must be maintained at all times by all nations. I do not believe it is possible not to have control if you want to avoid a situation in which, for example, the sovereign of a small country goes insane and invades someone else's airspace.

It would be like saying we can eliminate the highway patrol because there are fewer accidents.

ITALIA OGGI: Is it not slightly restrictive to consider the EFA to be just an air policeman?

F. Cereti: An aircraft that must control the skies must be extremely advanced, but also simple enough to operate to meet the exigencies of controlling any country's territory. Currently, rather advanced aircraft, such as the latest Soviet models, are readily available on the market at rather low prices. For this reason I think that an aircraft of this type will nevertheless be useful for defense against any "attack."

ITALIA OGGI: Is it just logistic necessity that makes the continuation of the project necessary, or are there other reasons that "demand" the EFA project?

F. Cereti: Yes, there are also other problems at the industrial and financial level, which justify the fact that such an expensive product should be produced in Europe rather than acquired abroad.

ITALIA OGGI: Will the EFA satisfy this European need?

F. Cereti: Either the EFA or another European product. One might consider the French Rafale, or the Swedish aircraft, but there must be a superfighter. It will be necessary to see how much the various alternatives cost, and how much they yield in technology and impetus to Italy's industrial system. Abandoning the EFA project would make no sense at all. All across Europe, people are convinced that this program should continue. Perhaps cuts should be considered, perhaps some sophisticated forms of electronic warfare equipment could be made less complex, but we are talking about figures after the decimal point, if I may be allowed to speak in numerical terms.

ITALIA OGGI: You therefore have no doubts that the aircraft will actually be developed?

F. Cereti: I believe that this aircraft will be developed. If this is not so, another, similar aircraft will be constructed in Europe. However, in this case, the amount already spent or committed (practically 80 percent of the investment, which is over 2.5 trillion lire for Italy), and the amount that is still unspent should be considered. The failure to develop the EFA could be particularly serious for Italy, which has the oldest air defense planes in Europe. After the F-104, the Germans bought Phantoms, the British have their Phantoms, and the Spanish bought F-18's, and Mirages. What about us? We have the F-104S which has been in service for almost 20 years. It is close to the end of its life and maintenance is very expensive. If we want to keep it in service another 15 years, we run the risk of having to pay very high maintenance costs.

ITALIA OGGI: What are the maximum technological levels that have been reached with the study of the EFA?

F. Cereti: We will be working on the frontiers of the most advanced technology in three principal areas from now through the near future. The first is materials: This aircraft will make wide use of very thick, carbon fiber materials. We are constructing the wing, the part subjected to the greatest stress. This technology has already been used in the EAP (the demonstrator developed by the British in collaboration with Italy; it has been in service for a few years to make potential clients understand that the Tornado group is still technologically at the top). The second area concerns artificial intelligence and expert systems: This aircraft has a highly automated series of commands and controls. The third point of innovation is the aircraft's aerodynamics, which is linked to the availability of automatic devices. The "machine" should be as light and unstable as possible to be more maneuverable. The more unstable it is, the faster it can change trajectory and maintain safety.

ITALIA OGGI: In closing, let us talk about company organization. How much will the Aeritalia merger with Selenia influence this program?

F. Cereti: Our presence in the EFA is very important, but the presence of Selenia is also qualitatively important. In the meantime, there will be an effect on Selenia's missile activities, which are certainly connected to the project. Later, there will be a synergy with the computer and artificial intelligence sectors.

Italy: Government, Industry Views on Future Space Policy

90MI0305 Rome SPAZIO INFORMAZIONI in Italian 24 Jul 90 pp 2-8

[Text] Where is "the Italian space sector" going? How and when will the problems that are still hampering its complete takeoff be solved? How are the roles of the various "protagonists" in this sector changing? What are the real medium- to long-term prospects? These were only some of the questions that seemed to circulate in the small crowded chamber of parliamentary groups in Rome at the opening of the recent meeting between government and industry on: "The Development Trends of Italian Space Policy," organized by the Ministry of Universities and Scientific and Technological Research, and the Italian Space Agency (ASI). Its organizers had planned the meeting to be an important opportunity to compare national space activities. On the one hand, to evaluate the complex situation of a sector which is undergoing an increasingly rapid evolution in Italy and on the other, to attempt to identify future prospects and goals, even in an international context.

The meeting was attended by a large number of representatives who contributed to this goal. They came from the political world, government, management bodies, the scientific community, specialized industries, and even small and large companies with no specific expertise in the space sector but which were probably harboring the idea of a future commitment with a view to

diversifying their production and developing high technology. The many speakers therefore, provided many opinions and some proposals. Of the many issues on the floor, some were just dealt with superficially by everybody (such as the problems that still seem to prevent the management and programming of activities in "the Italian space sector" from finally taking off). However, valid solutions were found for other issues and must now be put into concrete form. The real results of this meeting can only be demonstrated on the basis of future initiatives aimed at examining, improving, and directing the entire space sector which is undoubtedly preparing for the important challenge of the 21st century (hopefully in a proper and far sighted fashion).

The Speeches of Ruberti and Saporito

"The rapid growth in world space initiatives," stated the Minister of Universities, Professor Antonio Ruberti, during his speech, "is creating a large number of adjustment problems for the various national organizations. This is basically the case everywhere: In the United States, France, and the FRG the major programs of the last few years have called for a moment's pause in order to examine resources and streamline the management of these resources. This is still under way. Ambitious programs such as the American Space Station, and the ESA's [European Space Agency] medium-term projects are such that a series of studies on the skills required to complete these undertakings must be carried out: financial, intellectual, management, and industrial skills. This is happening at NASA, CNES [National Center for Space Studies] but even at ESA or DARA [German Space Agency for Space Affairs]. Italy is now going through this stage too. Upon ascertaining that room for growth does exist, the capacity to manage this growth completely must be ensured. It is precisely because the increase in opportunities has been so rapid and funding has been so generous, that the national space industry must look inside itself and ensure that its infrastructures, which will have to support this growth, are solid."

"As in other countries," the minister continued, "we in Italy are also undergoing a breathing spell and are examining the relationship between space projects and resources. This has allowed us to identify the weak points in our training system and industries. The establishment of the ASI and CIRA [Italian Aerospace Research Center] and the expansion of the San Marco project are a strong government contribution to help overcome our moments of weakness. Nevertheless, one of the prerequisites for success is Italian industry's direct commitment to training, the creation of jobs, and industry itself. Without this commitment, it would be difficult to achieve the required level of international competitiveness. The financial aspect instead, has not been a problem to date. The strong increase in commitments has been generously supported by our government, both for national and international initiatives. However, the future scene certainly indicates a growing financial need in the space sector. This trend, therefore, presents a problem." "I feel that we cannot respond to these new needs by shielding ourselves behind the untouchable principle of 'zero growth,' for too long." Ruberti emphasized. "I believe we have reached the point where we must define a new funding strategy which is more in line with current developments in the space sector, and which can lead us along less limited paths than those we have been following so far. In fact, the financial commitment at the European level will reach approximately 900 billion lire in 1993. The national space program, which represents a complementary factor that is indispensable for the growth of Italy's entire space system, must not be suppressed. When faced with these natural development trends, the government will do its part. Nevertheless, the ways and conditions of finding and distributing resources must be in line with the current status of space activities. First, this leads us to the observation that if we want to overcome any possible future limitations in funding, our sources must be more varied. Currently, space funding comes exclusively from research funds but as the space industry develops, it becomes more obvious that research is only a part of space activities. Another part could be more appropriately called technological innovation, and finally the third part which is still incidental, but which could become more important toward the end of the decade, involves market production. Therefore, three possible sources of funding can be identified. This increases the possibility of supporting space activities considerably and makes the assumption that the future of space activities is irrevocably linked to research funds, appear inadequate. Research will have to continue to make its own substantial contribution, particularly to ensure that Italian research continues to grow. However, we know that space projects must, and in fact, do go well beyond the limited resources that research would be able to offer in any case. In the near future therefore, the possibilities offered by innovation and a large public consumer market, should be thoroughly examined. This is another important chapter which must be opened in Italy. We have not been working in the field of space research as an end to itself, but because we also foresaw that space activities could provide important applications for an ever-expanding public. We feel we have now reached the point where the space sector should begin to establish increasingly closer ties with the large public consumer market. These are the most ambitious horizons that we must conquer. With this in mind," minister Ruberti concluded, "we need to search for market incentives, a demand market, and funding that can trigger off stable and continuous growth processes."

In his speech, the Under Secretary of the University, Senator Learco Saporito, emphasized the "strategic nature of space activities as the principal means of promoting technological and scientific progress; the need to increase or at least maintain the level of resources, primarily for national programs; the role of space in developing European and international cooperation; the problem of size for the major Italian space companies when competing in Europe and worldwide; and the expansion of industry." When he tackled the problem of

finding new financial resources for space activities in Italy, Sen. Saporito even suggested, "doing away with the current government-purchaser and company-operator arrangement," by asking industries in the sector to "participate in the risk, even by just taking on a proportionally modest share, but with a significant responsibility in the development of space programs." The under secretary of the University even stated that: "If funding has been set up for the aeronautics sector, I do not see why funding, which could even take the form of mortgages and advanced payments, cannot be set up for the aerospace sector." He also emphasized the fact that: "We do not want other administrations to give the ASI money that it manages for programs, but I do not understand why no use is made of the ASI's capability and professionalism. We are not asking for money, we are offering these tools to all the country. We must combine our resources to reach common goals. In conclusion, Sen. Saporito also stated that the Ministry of Universities is organizing a conference for the users of space activities to be held in Rome next fall.

The Opinions of IRI, RAI, and Fiat

"IRI [Institute for the Reconstruction of Industry] not only intends to maintain its current position in the future, it also intends to increase it substantially," stated the vice president of the institute, Professor Pietro Armani, who also reminded that IRI's presence in the space sector includes both systems and manufacturing activities through Aeritalia, Selenia Spazio, and other Finmeccanica-controlled companies, as well as systems and operational services (through Telespazio of the STET [Turin Telephone Finance Company] group). "The institute," Professor Armani continued, "plans to direct its own space activities, both in the industrial and services sector, more toward a greater market penetration, by also favoring international accords with groups of a similar level and importance. However, it should not be forgotten that the basis for a significant presence on the international market is primarily the existence of a consolidated and qualified national program, which Italy should therefore support and expand." At the conclusion of his speech, the vice president of IRI also underlined the following points: "1) Government expenditure in this sector must be reviewed (both in terms of skills and money to avoid accumulating deficits) to compensate for the gap that has built up between Italy and other industrialized countries. This should come about by maintaining the positions achieved to date particularly in the more important European programs (such as Columbus, DRS [Data Relay System], and Hermes) and by keeping our presence in bilateral collaboration programs with European agencies and NASA at the projected level (logistic module, SAR-2, Cassini, Tethered); 2) The ASI must reach its full operating capacity as soon as possible to start off on program strategies without delay and to respond quickly, efficiently, and "non- bureaucratically" to challenges from the outside world; 3) National industry, which already has some unquestioned leaders in certain strategic sectors, should also be assisted and urged in increasing its skills and specialization in these sectors, to avoid the fragmentation of government spending which would be detrimental to its efficiency. Of course, all the existing national expertise in the field of subsystems and parts should be used and improved; 4) Finally, the political decisions should be designed to launch applied national programs (TV and direct broadcasting satellites, satellite systems to monitor the environment, satellites for emergency telecommunications, and the industrial applications of microgravity etc.) so that national industry can then guarantee adequate returns on investments and the experimentation programs mentioned, and hence completely demonstrate its development potential. This will enable Italy to rapidly increase its presence on the international market as well."

The problems of the SARIT program (Italian Radio Broadcasting Satellites), were dealt with by the president of RAI [Italian Broadcasting Corporation], Enrico Manca, during his speech at the Rome meeting. He stated that: "The decisive match on direct broadcasting via satellite will take place in Europe between 1993 and 1994. If parliament and the government do not make a quick decision on funding for the SARIT program, Italy risks missing out on direct TV broadcasting. We must start right now, if SARIT-1 is to be launched in 1993-1994 and SARIT-2 in 1996. Hon. Manca continued: "The investments required to finance this project amount to around 700 billion lire over seven years. This is a strategic and decisive investment designed to bring Italian industry and the quality of Italy's technological development up to international standards. For this reason parliament and government must make a political decision which that will specify goals and resources, and give responsibility to private industry. IRI's role in this area is essential since the companies involved in the SARIT program are part of this institute: RAI, Selenia Spazio, Telespazio, and why not, SIP [Italian Telephone Company]. The common strategies, goals, and the most appropriate entrepreneurial instruments must be defined within the framework of IRI. A policy of technological advancement and company realignment which deals with the streamlining of ground networks and satellite systems in a logical way is the real issue." Manca concluded: "The hypothesis of a company with a majority public holding in which RAI has real entrepreneurial role, by owning and managing the ground network and satellites, is moving in this direction."

"The balance between space and technological development," stated the central manager of Fiat, Dr. Carlo Callieri, "means dealing with budgetary problems, the availability of resources, and the difficulties in balancing the shares. I agree that there is a need to find mixed forms of funding with contributions from different sources. However, although industry is ready on the supply side by having experimented all forms of collaboration (consortia, prime contracting, associations, etc.), on the demand side there is a problem in coordinating resources and sources of customers. We have tools that

are managed by the Ministry of Universities and Research and function, but other support instruments waste a great deal of resources. The experiences of Fiat and international competition tell us that the best path to follow is the one that passes through the logic of program contracts. However, the problem of coordinating the demand and public customers still remains. A step forward has been made with the ASI but other steps must be taken at the right moment. I would answer the request to participate in 'risk' by saying that the administrative tools which regulate contracts and are rooted in legislation dating back to 1890, do not seem suited for an efficient and repsonsible participation. The second feature," the Fiat director continued, "is the need to equip ASI with the appropriate operational tools. To do this, sufficient resources need to be invested in training, to make up for the technical and human skills that cannot be drawn from the market. Once the problems of financial and technical resources have been solved, ASI will deal with the problem of bringing its efforts up to the level of other countries; being one of the most important partners in Europe is nor like being a leader, such as France. A leader's spin-offs in terms of quality are more than proportional to the amount of resources invested. Therefore, the disproportion between quality and quantity, derived from being a partner and not a leader, will have to be corrected," Dr. Callieri concluded.

ASI, the 1990-94 Plan, and ESA

It was no accident that the last speech of the meeting was left to the president of ASI, Professor Luciano Guerriero. In fact, one of the goals of the meeting was to supply the Agency's management with an in- depth view of the relationships between government and industry in the space sector. Any useful elements could then be inserted in the 1990- 94 five-year space program, still being drawn up by ASI. "The lines of the new plan already exist and we have a scheme which is at an advanced stage," Prof. Guerriero assured a few days before the Rome meeting. At the meeting he then emphasized: "The importance of balancing ESA and national activities on a financial level," and that "resources for completion of programs (such as Italsat, Tethered, etc.), must be given due priority and will then be followed by programs established by the Interministerial Committee for Economic Planning (CIPE) (such as Italsat-2)."

As far as Italian participation in ESA programs is concerned, the president of ASI said that he was giving the third ESA conference between ministera to be held in 1991, "top priority to verify the validity of the current programs and how the role of the different countries is being respected in the development of ground infrastructures." Then passing on to the manufacturing sector, Prof. Guerriero stated that: "The ASI is extremely interested in Italy's industrial initiatives in this sector," such as the merger of Aeritalia and Selenia under Finmeccanica, the establishment of Fiat Spazio, concentrating the collection of satellite data under Telespazio and finally EFIM's [Manufacturing Industry Holding and Financial Company] rumored intention of coordinating the various areas of expertise in the space sector (which according to some sources, could involve Agusta Sistemi, Officine Galileo, Oto Melara, and SMA. Given this complex industrial situation, the president of ASI even hypothesized subdividing the projects into three large sectors: those involving manned satellites and systems to come under the Finmeccanica Group, those involving propulsion systems under the Fiat group, and finally, projects for data collection and processing under STET. The following points were also emphasized in an interesting document distributed by ASI at the Meeting (title: "Proposals for Industrial Policy Intervention in the Space Sector"): "1) The ASI must reach its full executive powers as soon as possible to carry out its wide ranging tasks in coordinating the sector in Italy, both in relation to the development strategy for the sector in Italy and in its role as spokesman for national industries, boards, and international industries; 2) the national industrial systems capabilities must be strengthened, by completing the streamlining process and concentration which Finmeccanica, Fiat, and Telespazio have already begun in Italy, and at the same time encouraging those initiatives which facilitate the expansion of the industrial network of subsystems and equipment; 3) the establishment of space facilities in the South that involve the ASI and industries in their appropriate roles should be encouraged; 4) market initiatives and those designed to create essential services need to be strengthened by establishing consortia in which ASI can participate in a minority role, in fields which are more developed from the operational point of view, such as telecommunications and earth observations."

Speeches by Aeritalia, BPD, Selenia Spazio, and Telespazio

In direct response to Under Secretary Saporito's proposal, the managing director of Aeritalia, Engineer Fausto Cereti, began his speech by saying: "Industry has always assumed its share of risk." He continued by saying: "We have always prepared our resources, and have set aside investments before being included in the various programs. One example is the more than 25 billion lire spent in the construction of Aeritalia's Integration Center in Turin. Industry can participate in the risks of winning or losing, but it cannot participate in the 'sheer' risk because this would mean taking on part of the cost." Speaking on the issue of the national panorama of the space sector, the managing director of Aeritalia also stated that the company: "Is very aware of the fact that the National Space program should be financed in proportion to the ESA's commitment. We are very willing to increase the number of companies working in this sector as long as they are competitive, and are aware that the market will shortly open out to an international environment." Eng. Cereti concluded by indicating the "three routes" which in his opinion, small companies should follow to remain in the space sector are: technological excellence, inclusion in consortia with European and American companies, inclusion in a larger company.

The Fiat group companies' work in the field of space propulsion instead, was confirmed by the president of BPD Difesa e Spazio, Dr. Marco Pittaluga, in his speech. He also pointed out that "Fiat Spazio could be compared to Arianespace: a commercial company which launches satellites." After having mentioned BPD's technological experience and production capacity, Dr. Pittaluga emphasized the company's role in the project for the development of the new Italian-American "San Marco Scout" carrier, as part of an ASI contract and in collaboration with the Aerospace Research Center (CRI) of the First University of Rome.

"We are going through a transition period," the managing director of Selenia Spazio, Dr. Andrea Pucci, stated, "and the development research, and acquisition of new technologies cannot be interrupted. European competition is not sitting still and we cannot content ourselves with the competitive position our industry has attained. In this field, you have to keep moving forward." When referring to future national space projects, Dr. Pucci emphasized that: "Italy is the third country in the ESA and the fifth among industrialized countries in the world but has yet to launch an applied space program, despite the fact that there are already many, such as SARIT, Italsat-2, and the Italian Reserved Communications and Alarm Satellite (SICRAL)." In his speech, the general manager of Telespazio, Dr. Raffaele Minicucci, first gave an overview of the company's latest initiatives, among them the signing of an agreement with the soviet company Pianeta for Italian reception of long distance survey data collected by Soviet satellites and the joint study of remote sensing applications in the environmental sector; the development of an antenna at the Fucino center for the direct reception of French "Spot" satellites following the recent acquisition of a shareholding in Spot Image; and finally, the establishment of the Mediterranean Long Distance Surveying Center in Scanzano, near Palermo. In this context, Dr. Minicucci also stated that: "By taking advantage of this special moment of awareness in environmental issues, the ASI could make a decisive impact on national space activities by supporting and solving problems which concern the entire community, both through finalized projects and industrial developments. An answer to this need," he continued, "might consist in a remote-sensing pilot project, designed to develop data processing and interpreting methods to create parameters which the users can readily use. There is also interest in a telescience project, such as a system for direct earth-to-space connections to enable users to conduct their experiments directly from earth, as well as the Planet Earth project, designed to generate and broadcast environmental data, new technologies, and participate in international monitoring programs." In concluding, Telespazio's general manager faced the issue of ground infrastructures for future European projects (such as Columbus, Ariane- 5, and Hermes). He emphasized the fact that "Italy's overall returns are rather modest here, especially if compared to the financial and technological effort put into these programs. It is therefore important," Dr. Minicucci concluded, "for the next Italian space strategy to lead to a renegotiation of European ground infrastructures by supporting a more consistent Italian role in the attribution of operational and control centers for satellites such as the SAT2/TM-Artemis, the DRS, and the polar platform for earth observation."

Italy: Launch Site Project Receives Additional Funding

90MI0259 Rome SPAZIO INFORMAZIONI in Italian 23-30 May 90 pp 5-6

[Text] The Interministerial Committee for Economic Planning (CIPE) has recently approved a resolution that authorizes the Italian Space Agency (ASI) to allocate 30 billion lire in 1990 for a program to increase the launch capability of the San Marco Project. The resolution—which follows the request submitted last winter by the Ministry of Universities and Research—has been approved as part of ASI's Space Plan for the 1990-94 five-year period, which is still being prepared. During the Committee's meeting, chaired by the budget minister, the Honorable Paolo Cirino Pomicino, the Minister of Universities, Professor Antonio Ruberti, was requested to urge the ASI to present the five-year plan. The financial resources required for the planned expansion of the San Marco project total 90 billion lire for the 1990-92 three-year period. Of this total, 30 billion lire have already been included in ASI's cash budget for the current year, while the remaining 60 billion lire will be allocated over 1991-92 as part of the budget for the five-year plan.

Details of the Expansion Program

The program to increase the launch capability of the San Marco Project, which is the subject of a specific proposal made by the project director, Professor Luigi Broglio, is divided into two parts. The first involves the development of the San Marco Scout carrier (a more powerful version of the standard Scout produced by the American company LTV) in the shortest time possible and with the minimum risk, by using the Scout's various subsystems during the first stage and subsequently replacing them with those developed by BPD Difesa e Spazio for ASI. The first flight of the San Marco Scout-1—the basic configuration of the new carrier, which can be made more powerful by increasing the number or the capability of the solid propellant releasable boosters—is scheduled for June 1993, when a NASA satellite will be launched from the American Vanderberg launch site. The second phase of the program involves improving the launch equipment and the satellite reception and control station at the San Marco launch site in Kenya, as well as training the new personnel that are specialized in various fields. According to Prof. Broglio's estimates, 60 percent (54 billion lire) of the 90 billion lire to be allocated over the 1990-92 three-year period will be used to develop the San Marco Scout, while the remaining 40 percent (36 billion lire) will be used to improve the Kenya launch site.

Italy: Status, Goals of Italsat Program Examined

Testing Program

90MI0268 Rome AIR PRESS in Italian 13 Jun 90 pp 1409- 1410

[Text] Despite the three-to four-month delay in the launch of Italsat, the Italian national telecommunications satellite, its entry into service will not be postponed. The delay caused by the interruption of the Ariane launches following the failure of flight number 36 will be offset by advancing the tests scheduled to take place after the launch. The above statements were made in Toulouse by Andrea Pucci, managing director of Selenia Spazio, the company that built the satellite, and Franco Marconicchio, head of the program for the Italian Space Agency, as they presented the "fully satisfactory" outcome of the tests conducted on Italsat to date. According to Pucci, the Italsat program "is in line with projected times, costs, and performance." He added that Italsat "is an important element in Italian telecommunications, but there are also prospects for industrial spin-offs at the international level, even from countries which, until last year, had no faith in the Italian space sector's ability to build advanced satellites." Italsat is unique: It is the first telephone communications satellite with an on-board automatic switching system that switches transmission channels in real time according to changing traffic needs; in practice, an authentic telephone exchange.

Engineer Marconicchio emphasized that the Italsat program cost 546 billion lire and accounted for 40-45 percent of Italy's overall investments in the space sector. The Space Agency is now considering Selenia Spazio's offer to build a second satellite. Technical assessments have been completed and the agreement should be signed by the end of the year. Pucci stated that Italsat-2, "which should be launched into orbit in 1993, will cost decidedly less than the first model, as expenses for the latter included all R&D costs for the satellite and its ground stations. The 546 billion lire spent to date are, however, about half the market price for a similar program." According to Pucci: "The extremely complex nature of this satellite, the first in the world to use a switching system in orbit, should also be considered. The Americans and Japanese have also carried out similar studies for some time, but with no practical developments to date." In practice, the system involves a satellite with fewer channels, and consequently fewer pieces of expensive equipment than on large telecommunications satellites, but the channels are switched from time to time according to telephone traffic requirements.

At the Intespace laboratories in Toulouse, Italsat was submitted to tests involving acceleration and vibration twice the intensity of launch stress, the opening of parabolic antennas, and the extension of the large solar panels. Intespace has been working in the space sector for over 20 years and its shareholders are CNES [National Center for Space Studies], Sopomea, Matra, Aerospatiale, and Alcatel Espace. Engineer Claudio Mastracci, head of the Italsat project, reported that round-the-clock modem communications were maintained with the ESA's [European Space Agency] Darmstadt center. This center will control the satellite after its launch until it is carried into a geostationary orbit through the ignition of the apogee motor. Then, the control of the satellite will pass on to Telespazio's center in Fucino.

Tests of Italsat's resistance to heat, cold (from minus 150 to over 100° C), and space vacuum will begin this week. The series of tests will be concluded at the end of July, when the satellite will be ready for launch. Had the September deadline been met, Italsat would have left directly for French Guyana, to be mounted on an Ariane carrier. The delay in the launch (now scheduled to take place between late December and late January) will be used to start transmission tests initially scheduled to be carried out in orbit. These tests, which will take place at Selenia Spazio's plant in Rome, will last two to three months and will make up for the launch delay and ensure that orbit activity begins by the initially scheduled deadline of April or May 1991. Italsat is scheduled to be transferred to Kourou early in December.

The program for the second satellite, scheduled to be placed into orbit during the same launch as Italsat, is also likely to be modified. Instead of a European Eutelsat, it may be an American G.Star-4. Finally, although the Space Agency's insurance premium for the Italsat launch has not been established, Eng. Marconicchio concluded by saying that the failure of Ariane's 36th mission does not seem to have caused premium increases.

Italian Space Agency

90MI0268 Rome SPAZIO INFORMAZIONI in Italian 6-13 Jun 90 pp 2-3

[Excerpt] [passage omitted]

Engineer Franco Marconicchio, the Italsat program manager for ASI [Italian Space Agency], stated in Toulouse: "The Italian Space Agency is certainly satisfied with the results obtained to date and with the project's state of development." He also emphasized the objectives of the program: 1) High-technology development that will make Italy the first country in the world (followed by the United States, with its ACTS project, and Japan) to build and launch a satellite equipped with an on-board switching matrix and coherent modulators; 2) Systems aspect, which has enabled specialized Italian industries to develop a highly complex space system in its entirety; 3) The overall coordination of the manufacturing activities of industries involved in the "space" (satellite) and "earth" (ground stations) areas; 4) The development of a satellite telecommunications system capable of modifying the network configuration by changing the number of dedicated circuits in each individual area of Italy; 5) Increased collaboration with the agencies responsible for telecommunications management in Italy.

As far as Italsat-2 is concerned, however, Eng. Marconicchio disclosed that ASI "has reached a satisfactory stage, having completed its technical assessments," and that the new satellite, which is essential if the whole system is to become operational, may be put into orbit about four to four and a half years after Italsat-1. [passage omitted]

Italian Defense Industry Examines Space Research

90MI0282 Milan ITALIA OGGI in Italian 2 Jul 90 p 41

[Article by Georgio Santacanale: "The Defense Industry Looks for Space"]

[Text] Scientific missions in orbit, exploratory probes, satellites: Will the space sector represent an alternative outlet for military industries in need of reconversion? Or will space research also suffer the consequences of cuts in defense investments? What are the prospects for this sector in Italy? This article is the first in a series designed to answer these questions.

"There is no doubt that it would be advisable to invest a part of the defense budget in space. By doing so, public utility services could be developed to manage and monitor the environment, knowledge, and defense in the broader sense: no longer purely military defense but rather the survival of mankind in a more global and complete context. In my opinion observation, monitoring, and knowledge of the earth will be of fundamental importance in the future and should therefore be coverd by part of the budget that was formerly allocated for military defense. However, I absolutely exclude the possibility of the space industry replacing the defense industry."

This opinion, expressed by Ernesto Vallerani, director of Alitalia's Space Systems group, summarizes that of many experts in the sector. However, Learco Saporito, senator and under secretary at the Ministry of Universities and Scientific and Technological Research, is more optimistic and maintains that: "Space can facilitate the defense industry's reconversion, because common programs are being carried out by companies that produce for both the defense and civilian sector. One example is Aeritalia, which operates in both sectors. The center of attention can therefore be shifted to an area where the defense and civilian sectors are complementary."

The two statements should be interpreted in terms of balancing volumes and projections. The 80,000 people employed in defense production cannot be transferred to the space industry, which, after a decade of expansion, currently has approximately 4,500 employees and a 1988 turnover amounting to 540 billion lire (13 percent of the Italian aerospace industry's entire turnover). It would not be able to absorb them. The space sector can and must grow, but in a slow, progressive, continuous, and logical manner.

"Our concern as space people," explained Vallerani, "is that all those who see a lean period ahead for the defense sector will now deceive themselves into thinking they can find prosperity in the space sector. We would find ourselves with so many firms moving from the defense to the space sector that they would risk suffocating it without even obtaining concrete benefits in turnover and profits, given the very different expenditure levels for the two sectors.

"When the first energy crisis occurred", added the Aeritalia manager, "there was more than one suggestion that wind and solar energy be used instead of petroleum fossil energy. However, wind and solar energy can replace only a small percentage of traditional energy sources: between two and five percent. The same ratio applies to the space sector and the defense industry." The reconversion of the defense industry presents two other large problems. The first is to transform an industrial sector that employs 80,000 people in Italy without counting the supply industry. The second is to find a civilian substitute that can maintain, and if possible increase the country's technological potential. The defense industry in fact has always been on the frontier of technology. We only need to consider the complexity and performance of a modern combat jet or armored tank, which involved inventing and discovering new materials and realizing the potential of electronics. The single components have become "systems," giving rise to a new technology, system engineering, which is still not taught at the polytechnical institutes but was created and developed in the research offices and ordnance factories, with spin-offs in the civilian sector. One typical example: The GPS, global positioning system, which provides location in three-dimensional space, that was developed for the military sector and is now available for commercial aircraft, offering an extra safety guarantee for civilian flights and permitting geologists such as Ardito Desio to measure the exact height of the K2.

"From the strategic and prospective point of view, the space sector could play the same role that has been played by the military sector to date in providing technological spin-offs, since it certainly has the same leading-edge characteristics as those of the defense sector," maintains Andrea Pucci, managing director of Selenia Spazio. Pucci believes that space activities can become a useful alternative, with the exception of the work that currently falls within the military sector, at least those with a large electronic component. In both in the electronics and in the materials and structural fields, technological monitoring of space activities is similar to that of some defense programs; and for this reason reconversion would be sufficiently homogeneous.

[Box, p 41]

The president of the Italian Space Agency, Luciano Guerriero, believes that research offers interesting synergies. "In the free market, that of the West," Guerriero states, "many research projects could not have been carried out solely with the research funds allocated by

the individual companies. If these companies were able to make a certain type of investment, it was only because they were supported by defense research budgets."

The problem is worldwide, not only Italian, in that the domestic arms industry, even for political among other reasons, is not as important as in other coucntries where, as in the United States for national defense requirements, or by deliberate choice, weapons systems are produced for sale to third countries. But sooner or later, the new international political and military climate resulting from the agreements between Bush and Gorbachev and the transformation that will presumably, indeed inevitabl, take place in NATO will highlight the problem of the Italian defense industry's reconversion as well. The problem is felt so acutely that Carlo Fracanzani, stake holdings minister, has a document on this issue that was drawn up by a commission chaired, until his death, by Edoardo Amaldi, and currently by Antonio Zichichi, and which will be released known in August.

The reduction in the defense budget could therefore have a largely negative impact on technology-based civilian industry. "Let us not forget," adds Guerriero, "the countries that invested most heavily in this type of research later dominated the civilian markets with highly sophisticated technological products. Space activity involves the aeronautical and electronics industries, telecommunications, and materials, and was exactly the same industrial structures that work for the military sector. It is therefore the ideal recipient and vehicle for this type of research. The problem of replacing the industrial plant is another matter, however, as defense production is based on the mass production of weapons." Greater weight may therefore be attached to space to avoid missing the advanced technology boat, but not all are of the opinion that reconverting the entire military research sector to civilian research would be a good deal.

Italy: CARINA Unmanned Reentry Capsule Project Launched

90MI0311 Rome AIR PRESS in Italian 11 Jul 90 p 1678

[Text] The first official meeting to launch the CARINA [Unmanned Reentry Capsule], program whose development the ASI (Italian Space Agency) recently assigned to Aeritalia, took place in Naples on 3 July. CARINA will be compatible with the more powerful Scout carrier rocket. As a consequence Italy will have, together with the San Marco launch site, a complete ground system of small launch and recovery platforms. The goal of the program is to carry payloads for microgravity and other technological and scientific experiments on missions lasting from a minimum of five days to a maximum of three weeks and return these to earth. The possibility of reusing the components will permit the experiments to be repeated at very low costs. Once in service, CARINA will significantly increase the Italian and European scientific community's space activities. For Aeritalia, the program is of dual importance. First, its role of prime contractor confirms the prominent position—not only at the national level—that the company has acquired in the field of the scientific applications of space activities. On the other hand it inaugurates the group's entire systems operations in the Neapolitan area. CARINA will be designed and developed in the new plant in Capodichino. MARS [Microgravity Advanced Research and user Support Center], the company established by Aeritalia and the University of Naples in 1989 for the microgravity research and support will also contribute to the operation of the program. The general manager of the ASI, Carlo Buongiorno, and the director of Aeritalia's space systems group, Ernesto Vallerani were among those present at the meeting.

BIOTECHNOLOGY

EC Approves Human Genome R&D Program

90AN0369 Luxembourg OFFICIAL JOURNAL OF THE EUROPEAN COMMUNITIES in English 26 Jul 90 pp 8-14

[Article: "Council Decision Adopting a Specific Research and Technological Development Programme in the Field of Health: Human Genome Analysis (1990 to 1991)"]

[Text]**The Council of the European Communities,**

Having regard to the Treaty establishing the European Economic Community, and in particular Article 130q(2) thereof,

Having regard to the proposal from the Commission,

In cooperation with the European Parliament,

Having regard to the opinion of the Economic and Social Committee,

Whereas Article 130k of the Treaty provides that the framework programme is to be implemented through specific programmes developed within each activity;

Whereas, by its Decision 87/516/Euratom, EEC, as amended by Decision 88/193/EEC, Euratom, the Council adopted a framework programme for Community activities in the field of research and technological development (1987 to 1991), which defined activities to be undertaken in the field of health;

Whereas that Decision provides that Community action is justified where research contributes, *inter alia,* to the strengthening of the economic and social cohesion of the Community and to the promotion of its overall harmonious development, while being consistent with the pursuit of scientific and technical excellence;

Whereas two successive pluriannual programmes of research and training of the European Economic Community in the field of biotechnologies, the second of which is still in progress, have shown the possibility and

usefulness of Community action promoting the utilization of modern biology for scientific, medical and industrial purposes;

Whereas the framework programme provides, under the heading "Health" in the "Quality of Life" section, for the initiation of new activities relating to the development of knowledge of the human genome;

Whereas, following the adoption of a third Community Framework Programme for activities in the field of research and technological development (1990 to 1994), it is necessary to continue the implementation of the second Framework Programme (1987 to 1991) by means of specific programmes for which the latter makes provision;

Whereas a specific programme to study the human genome is therefore necessary and, in particular, it is necessary to:

- Develop and disseminate the basic technologies concerning the study of the human genome, with the intention of improving knowledge of matters of medical importance,
- Increase the resolution of the human genetic map and improve the physical map by the creation of ordered clone libraries, as a basis for locating genes of medical importance on chromosomes and for a better general understanding of gene function, and
- Organize networks and coordination, on a European and international scale, of researchers from all disciplines working in this field;

Whereas achievement of the above mentioned goals requires the undertaking at Community level of action aimed at:

- Filling some existing gaps in scientific and technological knowledge, and
- Encouraging cooperation between European research establishments with a view to furthering the development of existing technologies, while promoting all research sectors capable of generating new lines of research;

Whereas, simultaneously, measures must be taken to promote cooperation between the Community programme and similar ones developed in third countries or by international organizations;

Whereas the right to a genetic identity forms part of the integrity and the dignity of an individual and this principle is recognized in the constitutions and laws of Member States and in the Community legal system as forming part of the fundamental rights for which respect is ensured;

Whereas the results which can be achieved from human genome research require the development of an integrated approach, taking into account the medical, ethical, social and legal aspects of the possible applications of such results and the need to avoid any improper use thereof;

Whereas the development of an integrated approach was proposed by the European Parliament in its resolution of 16 March 1989;

Whereas there are good grounds for guaranteeing the right of an individual to have an informed choice as to whether or not he should receive information concerning his genetic characteristics;

Whereas, in absence of clear standards and provisions concerning possible developments in the field of genome analysis, there may be a risk, on the one hand, that attempts will be made to intervene in the human genome in order to make the modifications so obtained hereditary and, on the other, that genetic analysis will be carried out for monitoring purposes, which may have a profound effect on social life; whereas there are, accordingly, good grounds for taking the necessary steps to preclude unacceptable developments, particularly in terms of predictive medicine;

Whereas, furthermore, it is necessary to examine in detail, during the course of the programme, the prenormative aspects arising from human genome analysis by establishing a reliable scientific data set which could provide a basis for political authorities to establish sound, clear and responsible rules;

Whereas the Scientific and Technical Research Committee (Crest) has been consulted,

Has adopted this decision:

Article 1

A specific research and technological development programme for the European Economic Community in the field of human genome analysis, as defined in Annex II, is hereby adopted for a period of two years commencing on 29 June 1990.

Article 2

1. The funds estimated as necessary for the execution of the programme amount to ECU 14 million, including expenditure on a staff of two.
2. An indicative allocation of funds is set out in Annex I.

Article 3

Detailed rules for the implementation of the programme and the rates of the Community's financial participation are set out in Annex II.

Article 4

1. The Commission shall send the European Parliament and the Council an annual report on the progress of the programme.
2. In the second year of implementation of the programme, the Commission shall review it and send the results of its review to the European Parliament and the Council; the report shall be accompanied, where necessary, by proposals for amendment or extension of the programme.
3. An evaluation of the results achieved shall be carried out by independent experts and published in the form of a communication to the European Parliament and the Council.
4. The above mentioned reports shall be established having regard to the objectives and evaluation criteria set out in Annex II and in accordance with Article 2(2) of Decision 87/516/Euratom, EEC.

Article 5

The Commission shall be responsible for the execution of the programme. It shall be assisted by a committee of an advisory nature, hereinafter referred to as "the Committee", composed of the representatives of the Member States and chaired by the representative of the Commission.

Article 6

1. The representative of the Commission shall submit to the committee a draft of the measures to be taken. The committee shall deliver its opinion within a time limit which the chairman may lay down according to the urgency of the matter, if necessary by taking a vote.
2. The opinion shall be recorded in the minutes; in addition, each Member State shall have the right to ask to have its position recorded in the minutes.
3. The Commission shall take the utmost account of the opinion delivered by the committee. It shall inform the committee of the manner in which its opinion has been taken into account.

Article 7

The procedure laid down in Article 6 shall apply in particular to:

- The contents of the calls for proposals,
- The assessment of the proposed projects and the estimated amount of the Community's contribution to them,
- Departures from the general rules governing Community participation set out in Annex II,
- The participation in any project by third-country organizations and enterprises referred to in Article 8(2),
- Any adjustment to the indicative allocation of resources set out in Annex I,
- The measures to be undertaken to evaluate the programme,
- The arrangements for the dissemination, protection and exploitation of the results of research carried out under the programme.

Article 8

1. The Commission is authorized, in accordance with Article 130n of the Treaty, to negotiate agreements with third countries and international organizations, particularly with third countries participating in European Cooperation in the field of Scientific and Technical Research (COST) and with States which have concluded framework agreements for scientific and technical cooperation with the Community, with a view to associating them with the programme.
2. Where framework agreements for scientific and technical cooperation between third countries and the European Communities have been concluded, organizations and enterprises established in those countries may, on the basis of the criterion of mutual benefit, become partners in a project undertaken within this programme.
3. No contracting party based outside the Community and participating as a partner in a project undertaken under the programme may benefit from Community financing for this programme. Such contracting party shall contribute to the general administrative costs.

Article 9

This Decision is addressed to the Member States.

Done at Luxembourg, 29 June 1990.

For the Council—The President—M. Smith

ANNEX I

Indicative Internal Allocation of Resources

	ECU million
Improvement of the human genetic map	3.3
Physical mapping (ordered clone libraries)	3.4
Data processing and databases	2.2
Improvement of the methods and basis for the study of the human genome	2.2
Training	1.9
Ethical, social and legal aspects	1.0
Management and staff	1.0
Total	15.0

ANNEX II

Specific Research Programme in the Field of Health: Human Genome Analysis

1. Objectives

Use and improvement of new biotechnologies in the study of the human genome for a better understanding of the mechanisms of genetic functions, as well as the prevention and treatment of human diseases. In the pursuit of these objectives, optimal cooperation will be sought with the programmes of third States and international organizations.

At the same time, measures will be taken to draw up an integrated approach to the medical, ethical, social and legal aspects of possible applications of results obtained through the programme to ensure that they are not misused and also, with prenormative aspects in mind, to establish a set of bioethical principles to be followed in the developments to come.

Alteration of germ cells or any stage of embryo development with the aim of modifying human genetic characteristics in a hereditary manner is excluded from the programme objectives.

2. Technical Content

Precompetitive Community research, setting up and reinforcement of networks of European Laboratories, and training, intended to allow the use of modern technologies for the study and setting up of the human genetic map as well as possible medical applications of the knowledge gained.

The research described below will require the use of data-processing facilities for the handling of data and the setting up of integrated databases to serve European networks, in close cooperation with other Community research programmes.

2.1. Improvement of the Human Genetic Map

Setting up a European network, extending worldwide, for the collection and mapping of the DNA of large families, in order to provide research scientists with well-characterized genetic material and sets of probes to determine the location of the relative positions of genes on the chromosomes.

2.2. Setting Up of Ordered Clone Libraries of Human DNA

Setting up of a European network of laboratories working on establishing overlapping clone libraries and support for limited sequencing of cDNA.

2.3. Improvement of the Methods and Basis for the Study of the Human Genome

New biochemical reagents (restriction enzymes, etc.). Improvement of methods for the detection and localization of genetic markers (techniques for labelling DNA probes, amplification of genes, etc.). Development of new vectors for the cloning of large DNA fragments and of procedures for the transfection of chromosomes.

Development of model systems for the reproducible and stable expression of medically important genes both *in vivo* and *in vitro*, aimed at the wellbeing of patients. Development of new computer software for the storage and manipulation of data from genome sequencing and mapping.

2.4. Training

Setting up of a training programme to assist with the technology of molecular genetics methods, in particular to Member States in which these techniques are currently underdeveloped.

3. Implementation

3.1. The programme shall be implemented through entering into cost-shared or marginal cost contracts, support to centralized facilities and new or existing networks, entering into training contracts, issue of training grants, organization of courses, consultations with national experts, organization of study-group meetings, participation in seminars and symposia, publications, studies, dissemination of results to all interested groups and organization of public presentations.

For shared-cost contracts, the Community participation will be up to 50 percent of the total expenditure. However, in the case of universities and research institutes carrying out projects under this programme, the Community may bear up to 100 percent of the additional expenditure involved. In other cases, Community participation could reach 100 percent.

Participants may be research establishments, universities, private enterprises or combinations thereof located in Member States or in the third countries referred to in Article 8, or competent organizations in a position to make a significant contribution.

Projects must be carried out by participants from more than one country, and include at least two independent partners from two Member States.

Fellows coming from third countries will be accepted in the training programme, provided that they meet the required conditions and that their costs are covered from other sources, such as other Community programmes or actions which support fellows from developing countries.

The contracts concluded by the Commission will govern the rights and the obligations of each party, in particular the means of distribution, protection and exploitation of the results of the research.

3.2. The drawing up of research contracts can only take place if the contracting parties undertake to abstain in this programme from all research modifying, or seeking to modify, the genetic constitution of human beings by alteration of germ cells or of any stage of embryo development which may make these alterations hereditary.

The contracts shall regulate the granting of licences arising out of research project and, in particular, there shall be no right to exploit on an exclusive basis any property rights in respect of human DNA. In addition, the Commission shall reserve the right to publish the results of the research performed within the scope of the contracts.

The contracts will guarantee that the members of the families participating in the studies referred to in paragraph 2.1 will be fully informed of, and have consented to the use and study of, their DNA. The contracts will also guarantee complete protection of the confidentiality and anonymity of the personal data obtained in the programme.

3.3. The Commission will ensure that during the execution of the programme there will be wide-ranging and in-depth discussion of the ethical, social and legal aspects of human genome analysis and that possible misuses will be identified regarding applications of the results obtained or of future developments of that research. It will ensure that the far-reaching consequences of the research will be evaluated in a responsible manner and will submit to the European Parliament, the Council and the Economic and Social Committee an annual report, possibly with legislative recommendations arising as much from the research policy angle as from the legal one. To this end, the Commission will obtain advice from experts in different fields of science, law, philosophy and ethics, together with representatives of patient's associations.

4. Evaluation Criteria

The communication from the Commission to the Council on a Community action plan relating to the evaluation of Community research and development programmes states that the objectives and milestones for each research programme have to be set out in verifiable and, where possible, quantitative form. These reference marks are listed below:

4.1. The long-term objective of this programme is to contribute to a better understanding of the mechanisms of genetic function as well as to the fight against human diseases arising from genetic variation (including genetic diseases *sensu stricto* and many common diseases with a genetic component, such as heart disease and cancer), through early diagnosis, prevention, and improvement of prognosis and therapy. The Commission proposes to achieve this objective by:

- The organization of networks of laboratories around European facilities for (a) the improvement of the human genetic map, and (b) the setting up .MDSB/ .MDNM/.MDSU/.MDNM/of ordered clone libraries of human DNA, either of the complete genome or of selected chromosomes, together with cDNA sequencing,
- The launching of a programme of prenormative research aiming at improvement of the methods and basis of the study of the human genome,
- The setting up of a programme of training to increase the distribution of modern genetic technologies in Europe and to improve technological know-how in European laboratories,
- The promotion of cooperation with third countries and international organizations.

4.2. The primary short-term objective is that the programme should succeed in establishing the above mentioned European networks of laboratories in the fields of:

- The human genetic map,
- Ordered clone libraries of human DNA and cDNA sequencing,
- Improvement of the methods and basis for the study of the human genome, by using data-processing facilities for data-handling and by setting up integrated databases.

These objectives should be verifiable in 1991.

4.3. Particular objectives to be attained within two years of the programme's implementation are as follows:

4.3.1. Concerning the human genetic map:

- The present total of 40 well-studied large families which form the basis for the genetic map should be increased to 60 families,
- Genetic material from these families, and DNA probes, should be made available to the European laboratories concerned, while respecting the individual rights of those families,
- A central facility should be identified to pool the results and establish an improved genetic map at the one to five centimorgan level, and an integrated databank should be set up.

4.3.2. The strategies for setting up ordered clone libraries of human DNA should be compared and a better approach defined; facilities for maintaining the stocks of cloned DNA fragments should be established and the available clones dispatched to interested European laboratories.

4.3.3. Substantial improvements should be obtained in the following research fields to improve the methods and the basis for the study of the human genome:

- New reagents, such as restriction enzymes,
- methodology for cloning large DNA fragments and for the transfection of chromosomes,
- gene vectors adapted to human somatic cells *in vitro*,
- Methodology for the detection of a particular gene in a cell,
- Localization, cloning and sequencing of new genes, especially those which are disease-related,
- New computer software for processing of DNA sequence data.

4.4. In addition, the programme should ensure that the following general criteria are met:

4.4.1. That throughout the execution of the programme, the ethical, social and legal aspects of human genome analysis should be the subject of wide-ranging and in-depth discussions, and possible abuses of the results or later developments of the work should be identified; principles for their utilization and control should be proposed.

4.4.2. That the drawing up of research contracts should presuppose that the contracting parties undertake to abstain in this programme from all research modifying or seeking to modify the genetic constitution of human beings by alteration of germ cells or of any stage of embryo development which may make these alterations hereditary.

4.4.3. That the members of the families taking part in the studies mentioned in point 2.1. must have been informed and must have given their consent, and the confidentiality and anonymity of personal data must be ensured.

4.4.4. That the development and the application of somatic gene therapy are not provided for within the framework of the present programme.

4.4.5. That only somatic actual or potential medical applications should be facilitated.

4.4.6. That potential opportunities for industrial development should be explored.

4.4.7. That the overall scientific standard of the participating European laboratories must have been improved.

4.4.8. That, taking account of the results of Community, national or commercial research activities in human genetics, the evaluation panel should consider whether the human genome analysis has contributed to the transfer of knowledge and the development of the results of the said activities in regions of the Community other than those in which the research was conducted. The evaluation panel should also ascertain whether cooperation with third countries and international organizations has indeed been achieved and whether this cooperation has had positive results.

Italy: Biotechnology Laboratory Network Planned

90MI0269 Milan ITALIA OGGI in Italian 26 Jun 90 p 48

[Article by Michela Fontana: "A Laboratory Network To 'Manufacture' Biotechnology"]

[Text] One of the projects promoted by CIB, the Inter-university Biotechnology Consortium that includes 15 Italian universities, is a laboratory network to carry out biotechnology research oriented toward industrial applications.

The first laboratory will be inaugurated in Trieste by the end of the year at the Trieste Research Area, where the consortium has its administrative and operational headquarters. It will also act as an interface between Italian universities and UNIDO's [United Nations Industrial Development Organization] Trieste-based International Genetic Engineering and Biotechnology Center, directed by Arturo Falaschi.

Domenico Romeo, president of the Trieste Research Area and CIB director (who attended the consortium's first conference on "The University and Biotechnology Innovation," held in Milan yesterday), explained: "The Trieste laboratory is the first step toward the establishment of a national network. Exchanges between the academic world and industry will be carried out more effectively within these centers rather than in a purely university environment."

The goal of the consortium's scientific committee is for each laboratory to take a multidisciplinary approach to specific issues, with particular attention to applications.

"Initially, the Trieste laboratory will be involved in gene mapping and the development of automated systems for DNA sequencing," Romeo commented, "so that these will rapidly become marketable products of industrial interest."

Romeo described CIB's role in general terms: "Our goal is to demonstrate the innovative capability of Italian universities in various biotechnology sectors. We want to show that the ability to carry out basic research exists, as well as the ability to transfer the results to the manufacturing sector."

Lilia Alberghina, a member of CIB's scientific committee and director of the University of Milan's postgraduate school of biotechnology (which recently awarded its first diplomas), added: "The consortium intends to act as a coordinating center whose goal is to promote the development of research groups until they reach a sufficient size. Unlike the traditional branches of study in Italian universities, it has a "transversal" structure that consists of research groups of biochemists, genetic scientists, chemists, engineers, pharmaceutical chemists, biologists, etc. It will act as an interface with the industrial world. The initiative is based along the same lines as those of various other European countries."

Romeo places particular importance on international contacts and intends to promote the best links between the consortium and other European countries.

The first part of the funding, allocated within the 1988 budget soon after CIB's establishment, and by the centers involved in the consortium, was used primarily to equip all the centers with the new, large machinery required to carry out research.

Other initiatives underway include setting up a data base to collect information on the size, projects, and scientific productivity of over 150 operational units. If a company wishes to start a research program, it can use the data base and the consortium to obtain the necessary contacts.

"In this way," Alberghina commented, "industry will no longer be obliged, as was often the case in Italy, to renounce some advanced initiatives or to turn to foreign centers."

Romeo commented on the quality of scientific expertise in the Italian biotechnology sector: "Despite the high level of research in all fields, there are fewer biotechnology companies in Italy than in other countries. Perhaps our researchers are not oriented toward becoming businessmen." Romeo continued: "Contacts between researchers and the industrial world to date have been most successful in the pharmaceutical sector. A growing interest is currently being shown in using biotechnology to solve environmental problems."

Alberghina added: "In Italy, the sectors that are closest to applications are medical, agricultural, food, and environmental diagnostics, together with all that concerns the development of industrial biotechnology processes."

Italian Firm Produces Genetically Engineered Silkworms

90MI0283 Milan ITALIA OGGI in Italian 3 Jul 90 p 42

[Article by Marina Cosi: "Aphrodisical Menu For Silkworms: The New Direction In Silk"]

[Text]

Aphrodisical Food for Exuberant Silkworms

With a secret but natural feed mixture, silkworms will be able to reproduce 25 times a year instead of the traditional four. In this way Italy will be rescued from the monopolistic demands of the Chinese in the not-too-distant future.

The project is being developed by the Ratti Group and ENEA [Italian Committee for R&D of Nuclear and Alternative Energies], and is financed equally by both (three and one half billion lire). By next year, a prototype plant to artificially breed the very precious little animal on an industrial scale will be constructed at Guanzate (near Como, where the Ratti plants are located). The biofactory will produce eight metric tons of cocoons annually, the equivalent of 1.2 metric tons of raw silk. Italy currently imports 4,400 metric tons of raw silk per year, 3,100 of which comes from China (at 100,000 lire per kg).

Alternative solutions had been studied and tested for some time, until September last year, when Ratti and ENEA announced the launch of the production phase of the "silkworm breeding project." The entire Como textile industry places great hope in its success for several reasons: The crisis that has affected certain areas of the Italian textile industry; the Chinese policy of export quotas for raw silk (to "boost" its own textile industry), and the recent and heavy increase in prices at origin.

The problem was that the silkworms are fussy little things, always accustomed to eating mulberry leaves, and possibly only those without dressing. A dangerous dietary dependency—as was demonstrated by last year's fall in production due to the careless use of a certain insecticide in orchards.

A Japanese solution was already on the market. Except that this feed, which was recently patented in Japan and is the only alternative feed in existence, has the double disadvantage of being expensive (more than a billion lire for the patent) and usable only during the "weaning" period. With the Japanese feed, the use of mulberry leaves in the diet is reduced but not eliminated.

Strengthened by the expertise acquired in breeding insects for use in agriculture, ENEA developed a particularly interesting solution that combines three levels of innovation: A semisynthetic feed which has sugar and soya as its basic components; the use of silkworms that have been adapted to the artificial diet, and the use of automated plant technologies. Although the feed costs one and a half times more than mulberry tree leaves, it permits a fivefold increase in reproduction.

The Ratti Group will be responsible for this first operational phase of the project, lasting from three to five years, and will be involved in equipping and then managing the plant at Guanzate. A research laboratory will work together with the biofactory to monitor the quality of production, while a technological hall will prepare the feed and update the technical methods used.

One challenge remains before complete independence from overseas is achieved: A little animal that "speaks Italian." It has not yet been possible to obtain the egg of a national polyhybrid silkworm, although experiments continue to adapt several polyhybrids developed by the Ministry of Agriculture's experimental silkworm rearing center to the artificial feed. In the meantime, an agreement has been reached with the Japanese for the supply of a polyhybrid egg that can produce cocoons of a consistent quality and quantity.

FRG: BMFT Subsidizes Polysaccaride Research

90MI0242 Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN in German 28 May 90 pp 4-5

[Text] For about two years the BMFT [Federal Ministry for Research and Technology] has subsidized a joint research project on polysaccharides in the field of regenerating raw materials. The project was developed with the substantial participation of the cellulose-and starch-processing chemical industries of the Chemical Industry Association and jointly with representatives of technical institutes.

As part of this project, the BMFT is currently subsidizing 17 projects at 13 different universities and research institutes for a total of approximately 10 million Deutsche marks [DM].

The goal of these efforts is to reduce the research and training gap in this field that resulted from years of lack of research, thus creating the need to guarantee the current uses of polysaccharides in the chemical industry by improving ecological and economic procedures.

In addition, new application fields for these regenerating raw materials need to be developed. In this way the chemical industry will be guaranteed a constant supply of raw material for the production of biologically decomposable products, and at the same time a contribution will be made toward reducing surplus agricultural production.

Polysaccharide research centers will be set up again at universities to train a new generation of research and teaching scientists and to establish a scientific basis for industrial activity in the field of polysaccharide chemistry.

The projects deal with the problems related to the analysis of polysaccharides and polysaccharide products, their isolation and derivation, with particular attention to emission-free cellulose production and bleaching as well as the discovery of ecologically safe and inexpensive derivation processes. A third key project is the production of new polymers using carbohydrates or carbohydrate components. Research is underway in this field to develop polysaccharides for medical applications and, in combination with synthetic base material, for the production of polyamides, polyvinyl saccharides, polyesters, and polyurethanes.

Some of the results achieved so far are promising. After the end of the starting phase in late 1991, which is 100-percent subsidized by the BMFT, industry will financially participate in various projects and, together with research institutes, will promote the industrial application of the findings obtained in pilot plants.

This type of procedure has already been concretely applied in one project for the ecological production of chemical cellulose. Progress in this field is urgently needed since the processes currently used can no longer meet environmental protection requirements in an economically justifiable way, and since the cellulose-processing industry's requirements for raw materials are increasingly covered by imports, in which specific quality requirements cannot always be met satisfactorily.

Results were also obtained in the synthesis of new polymer materials from carbohydrates, which justify a substantially more intensive continuation of this line of development.

Industry Accuses EC of 'Political Hostility'

90AN0358 Brussels EUROPE in English 6 Jul 90 p 14

[Report: "Biotechnology/Industry/EEC: European Industry of Biotechnological Sector Criticises the Policy of the EC in This Area"]

[Text] Brussels, 5 July (EU)—During a meeting of the CEFIC's [European Council of Chemical Industry Federations] Senior Advisory Group on Biotechnology, the participant firms (including the German company Hoechst, Italian Ferruzzi, and British ICI) accused the EC of "political hostility" towards the biotechnology sector and provoking investment leaks towards Japan and the United States. Investments in this sector dried up in the EC in 1989. Although 82 percent of the ECU 3.244 billion worldwide investment came from European sources, a mere 3 percent of the funds was physically allocated to R&D projects inside the EC. Concerned, industry considers that the EC is suffering from

what Mr. Brian Ager, director of the advisory committee, defines as: "an incoherent and adversarial regulatory system, which creates unacceptable risk and cost for all biotechnology investors". Particular anger has been directed at the recently approved EC directive concerning GMOs, Genetically Modified Organisms, which not only entails double test procedure but which concentrates more on the manufacturing processes of GMO rather than on the GMOs. "The correct approach is to determine the category", says Ager, "into which any product of biotechnology falls for regulatory purposes (e.g., food, pesticide, pharmaceutical), and to apply those sectoral rules on a non-discriminatory basis".

A scientific expert from the European Commission believes, however, that the biotechnology industry has found a scapegoat for the disappointing investment results achieved during the '80s.

State of Dutch Industry Discussed

90AN0292 Rijswijk PT/AKTUEEL in Dutch 11 Apr 90 p 8

[Article: "Economic Affairs Is Sparing With Follow-Up Support for Promising Biotechnology Projects"]

[Text] Biotechnology in the Netherlands is blooming and the prospects are excellent, according to a report entitled "Biotechnology and Dutch Industry" from the Arthur D. Little agency. However, the Ministry of Economic Affairs feels that the incentive program for biotechnological research, known as IOP-b, which expires in May 1990, should not be followed up by further research incentives. Both of these facts became apparent at the third Dutch Biotechnology Congress in Amsterdam.

The Ministry of Economic Affairs finds that the follow-up of the Innovative Research Program in Biotechnology (IOP-b) must be the responsibility of (one or more) centers of excellence and research institutes, and that no further research incentives are necessary.

This was said by Dr. Cand. M.C. van der Harst, director general for industry at the Ministry, this week at the third Dutch Biotechnology Congress in Amsterdam in answer to a report by the Strategic Work Group which appeared a few weeks ago. This advisory group, under the chairmanship of Professor Schilperoort, examined what should be done after completion of the IOP-b program in May. One of its suggestions was the creation of a research management organization, to be known as BIRD, and the launch of a new program for the stimulation of strategic biotechnological research.

Van der Harst did not only hold back from further encouragement, he also had reservations about an organization such as BIRD. He would prefer coordination to be effected by the existing steering committees within the universities.

Growth

Nevertheless, the conditions for biotechnology development in the Netherlands are exceptionally favorable. The projected annual growth of eight percent for the 1990's is far above the expected average growth rate of the economy as a whole. Dutch employers look toward the future of biotechnology with confidence. This is apparent from the report "Biotechnology and Dutch Industry," which concluded that in such sectors as fine and specialty chemicals, vaccines, diagnostics, plant selection, and water purification, growth could be even higher than eight percent. Government incentives have had major impact on this development. The Arthur D. Little report points out that under the nearly completed IOP-b program, universities and institutes have performed 600 man-years of biotechnological research. In addition, about 150 biotechnology research projects were conducted by industry within the scope of the "Company-Oriented Technology Promotion Program" (PBTS); this number is due to increase in the coming years. Arthur D. Little points out that government support to industry plays an important part in the start-up of biotechnology activities.

The Netherlands has at the moment about 150 enterprises directly involved in biotechnology. This number will increase in the future. Over the last 5 years, the number of businesses active in modern biotechnology has increased by 40 percent. In 1989, industry spent an overall 250 million guilders on biotechnological research and development; a similar amount was spent on production investment.

Cooperation

The report also says that universities and institutes have significantly contributed to the development of biotechnological activity in the Netherlands' industry. Cooperation between industry, universities, and institutes, which is at a high level, is considered a prerequisite by industry. In addition, cooperation with foreign universities and institutes has increased, although to a lesser degree. In the Dutch research infrastructure, major biotechnology centers are being set up.

According to industrial sources, the most serious bottlenecks are intellectual property regulation and the issuing of biotechnology regulations. Industry has no problems with restrictive regulations, but it does object to uncertainty, lack of clarity, and overregulation.

COMPUTERS

French Neural Network Research Reviewed

90AN0285 Paris ELECTRONIQUE HEBDO in French 12 Apr 90 p 11

[Text] Neural networks are giving rise to much study in Europe, and particularly in France.

Take Thomson-CSF, for example, which is developing applications in the field of image and radar signal processing.

The Pygmalion project, which is conducted within the scope of the European Strategic Program for Research in Information Technologies (ESPRIT II) under the leadership of Thomson-CSF-DSE (Electronics Systems Division), focuses on the development of hardware and software tools.

The first phase, which runs from early 1989 to late 1990, comprises two sections: software and hardware. The software section involves the development of utility programs interfaced in C++ language, destined to perform neural network simulations. The hardware section, which is being conducted by Thomson-CSF's Central Research Laboratory (LCR), should lead to the development of an experimental neuron chip. The LCR is also studying a technology aimed at developing a circuit of 1,000 interlinked neurons. This technology will be based on the use of a ferroelectric thin film separating two orthogonal sets of electrodes and analog performance of the neural operation through pyroelectric charge transfer. At the electronics laboratory of the Paris School for Advanced Physics and Industrial Chemistry (ESPCI), a series of theoretical and practical studies are being conducted under the leadership of Richard Dreyfus. Next to simulations on Transputer networks and the improvement of learning methods, the school is working with Bell laboratories on the development of an automatic recognition system for handwritten postal codes, which should be operational within a year. Finally, for the past two years, the National Office for Aeronautical Studies and Research (ONERA) has been examining the properties of various types of networks and, within the framework of the ESPRIT-ANNIE project, it is comparing the advantages of neural networks over expert systems.

DEFENSE INDUSTRIES

French Companies Face Changing Needs

Some Projects Unrealistic

90WS0067A Paris LE MONDE in French 4 Jul 90 p 22

[Unsigned article: "Weapons: Overly Ambitious Program"]

[Text] Report of Revenue Court

We continue to publish major excerpts from the annual reports of the Revenue Court.

The Revenue Court notes that the military program which determines investments in nuclear and conventional weapons, contains discrepancies, distortions, and flaws that in the long run can impair the effectiveness of the French armed forces.

This program which spans four or five years depending on circumstances, is overly ambitious, and does not receive sufficient financing from annual budgets to successfully complete all the weapons projects that are started.

The Court cites a number of examples. "It will be very difficult," it comments, "to finance between 1994 to 2000 all the major programs planned by the Navy General Staff and the Directorate of Naval Constructions," such as the nuclear aircraft carrier, the light frigates, the anti-submarine and anti-aircraft frigates, and the new generation of nuclear attack submarines. Furthermore, the "alarming" growth in expenses associated with equipment developments "raises the question of whether such a large number of developments could all result in construction or be amortized over a sufficiently large production, given the predictable resources." Finally, the lack of resources leads to the postponement of some projects or to their prolongation over a longer time, lest the future be burdened with the debt of accumulated financial obligations.

In its conclusions, the report stresses the need for an examination of methods, which would make the program more exhaustive, more realistic, and more coherent.

Unilaser Views Civil Market

90WS0067B Paris L'USINE NOUVELLE in French 14 Jun 90 p 29

[Article by Jean-Pierre Casamayou: "New Fields of Action for Unilaser"]

[Text] Active primarily in military applications, Aerospatiale's subsidiary prepares its offensive on industrial markets.

Unilaser's CEO, Alain Guigue, is not impressed by the offensive carried out by foreigners in the laser field. Completing the regrouping of the three major French companies (Cilas, Quantel, and Laserdot) under the Aerospatiale banner, he moves toward a counter-offensive. With the strength of his 475 employees (350 million in revenues), he outlines his battle plan: entry into the industrial laser source area with the Lisa company, development of laser weapons for the military, and sector focusing point. Despite the crowded industrial source market, Unilaser has not given up this slot: Even Quantel, specializing in scientific lasers, is developing a solid source of more than 3 kilowatts intended for welding applications. For the time being, the first carbon dioxide laser sources are being produced by the Lisa plant in the Nivernais (10 million in investments).

This remains to be transformed into a commercial success, which is quite difficult without the support a machine-tool manufacturer. Hence the guarded appeal to the government, which is responsible for the operation, to "prime the pump," because in order to remain viable, Lisa must reach a critical size estimated at about a hundred sources per year.

However, Unilaser's military activities have reached this critical stage. In Orleans, the Cilas subsidiary already mass produces lasers for telemetry or illuminators mounted on a number of weapon systems.

As a former weapons engineer, Alan Guigue wants to go further. He wants to use the research of the Cilas and Laserdot laboratories in laser-based weapons: blinding lasers or air defense lasers, such as the anti-missile Latex now being tested.

In the meantime, Unilaser wants to grow and catch up with its rivals by moving toward ancillary activities, such as adaptive optic components or lasing materials (crystals, doped glasses, and so on). Unilaser also wants to surround itself with PMI (small and medium-sized enterprises) in the sector, and draw agreements with French groups such as Thomson (which is already participating in BMI's capital) or foreign ones such as GEC-Marconi or MBB.

Satory Report

90WS0067C Paris L'USINE NOUVELLE in French 21 Jun 90 p 31

[Article by Jean-Pierre Casamayou: "Land Weapons: Uncertainty Time"]

[Text] The reduction in military allocations has accelerated international restructuring and cooperation at a time when the weapons industry is undergoing its technologic revolution.

It's the end of an era, the era of certainty, for land weapons manufacturers. Bounced between the threat of disarmament, budget restrictions, reduced exports, technologic upheavals, and industrial restructuring, many are wondering whether this 12th Satory Show is not the swan song of the profession. The Center for Strategic Studies and Planning, a prestigious French think-tank, thus had to organize this week its first international sessions on land weapons, in order to respond to the expectations of manufacturers disturbed by this uncertainty.

The first of these sessions concerns the consequences of the Vienna negotiations on disarmament. What will be its threshold? What weapons will be affected by these reductions? The answers to these questions will have to be known before developing new weapons such as the future family of VBM armored vehicles, since a light tank like the AMX 10 is expected to be adopted as a battlefield tank; with the expected consequences on budgets.

We are already witnessing some exchanges between Jean-Pierre Chevenement and Laurent Fabius, supporter of a reduction in military expenditures. The orientation is clearly toward a lowered revision of the military program law, despite the declarations of Francois Hollande, chairman of the Assembly's military allocations, who foresees a military budget of 200 billion in 1991, for an increase of 2.8 percent. Should entire weapon programs be eliminated, productions will be spread over time or reduced. In other words, a shakeup whose intensity and duration is difficult to predict.

And if this were not enough, all this world (between 80,000 and 100,000 people who generate 50 billion in revenues) is living through a technologic revolution: cannons, shells, and tanks are making way for missiles, "intelligent" ammunition, or combat helicopters, while their share of army budgets is increasingly reduced. Moreover, electronics and computers are forcefully penetrating land weapons: whereas electronics represented 10 percent of the AMX 30 tank cost in the 1960's, it currently accounts for more than half of the Leclerc tank price. The manufacturers must thus focus on other trades, while newcomers appear on the scene.

This trend will accelerate with the Giat armored vehicle (a veritable computer on tracks). Technologies derived from aeronautics, such as the multiplex data bus, navigation centers, or optronics, are being implemented on this tank, one of the reasons being that the magnitude of the production allows a sensible reduction in equipment costs. Consequently, newcomers such as Dassault Electronique or Sagem are carrying an increasing weight in the army's budget. In turn, conventional suppliers are adapting to the change as best they can. Even mechanical devices and ammunition become "intelligent": Creusot-Loire Industrie uses microprocessors for the Leclerc automatic loader, while SESM uses new technologies such as carbon/carbon or power hydraulics (pressure of 600 bars) for its transmission. Ammunition is also changing radically: Thomson-Brandt Armement for instance, spends 20 percent of its revenues (1.3 billion) to develop ammunition (shells, anti-tank mines) that can locate its target thanks to optronic or millimetric detectors.

Beyond this technologic shift, the land weapons industry is witnessing a total break with its traditional structures: arsenals are transformed into national companies, and international cooperation is taking shape in an industrial environment which until now has been very national. The emergence of the highly ambitious Giat Industries, which with its 14,300 people achieves 7 billion in revenues, is accelerating the restructuring. In the ammunition field, Luchaire (550 million revenues), SFM (170 million), and now Matra-Manurhin Defense (650 million), have joined the company chaired by Pierre Chiquet. For the armored vehicles, the game will be played between Giat, Panhard, Creusot-Loire, and RVI, unless the deal becomes European, since Giat, Germany's Rheinmetall, and Britain's Royal Ordnance already expect to work together on the new generation of tank gun. This cooperation will only intensify in order to counterbalance the budget reductions and will become a backdrop for the Satory Weapons Show.

Dassault Proposes EUROPATROL Aircraft Project

90AN0399 Ohain AVIANEWS INTERNATIONAL in English Jul-Aug 90 p 58

[Text] Dassault is proposing a European programme to develop a reconnaissance and surveillance aircraft

dubbed EUROPATROL. Complementing satellites and groundbased equipment, such an aircraft would have as its main missions arms control verification, electronic surveillance of military facilities, reconnaissance, maritime surveillance, and anti-submarine warfare. But as a dual-capable (military/civilian) aircraft, it would also be able to conduct environmental surveillance missions, monitoring air and sea pollution, radioactivity, the destruction of forests and natural disasters. To perform these missions, this aircraft would be equipped with radar, infrared sensors, cameras, and physical and chemical sensors, as well as sophisticated electronic processing equipment. EUROPATROL is being proposed as an alternative to the U.S. P-7 maritime reconnaissance aircraft, a purely military programme.

France, Italy Join in Missile Production

90WS0059A Paris LE MONDE in French 20 Jun 90 p 22

[Unattributed article: "France and Italy To Finance Anti-Aircraft Missile"]

[Text] On Monday June 18, the Delegation generale pour l'armement [General Weapons Delegation] (DGA), acting in behalf of the French and Italian governments, announced two contracts covering the design of a family of anti-aircraft weapons systems, by Thomson CSF and Aerospatiale on the French side and Selenia on the Italian side. The two contracts made with the French-Italian consortium Eurosam, which includes the three groups involved, represent an outlay of more than 10 billion francs to be shared equally by the two countries.

In October 1988 and again in December 1989, the French and Italian defense ministers, acting in behalf of their respective governments, made the contractual decision to launch such a program, aimed at producing a weapons system capable of intercepting aircraft or low-flying supersonic missiles. This cooperative effort is open to other European countries, particularly Spain and Great Britain, with whom discussions have now reached a very advanced stage.

The first contract announced to Eurosam by the DGA involves the development of two programs based on a single missile called the Aster 15 or 30, according to its range: First, the SAAM (surface-to-air antimissile) naval system implemented through the use of an Arabel radar system (in the French version) or an Empar radar system (in the Italian version) linked with the Aster 15 from a battleship for which it serves as self-defense; then, the SAMP [medium-range ground-to-air] which will replace the Hawk missile being used by NATO, mounted on trucks that also carry the command, control, and steering system and are linked with other trucks, each carrying eight vertical-launch Aster 30 missiles.

The second contract announced to Eurosam by the DGA involves the design of a medium-range anti-aircraft naval defense system, the SAMP/N, which uses the Aster 30 missile, capable of destroying supersonic craft in level or diving flight. In France, the first user of this family of anti-aircraft weaponry will be the aircraft carrier "Charles-de-Gaulle" after 1998.

Aerospatiale Participation in EUCLID Outlined

90AN0284 Paris ELECTRONIQUE HEBDO in French 12 Apr 90 p 3

[Article by Michel Heurteaux: "European Defense Industry Mobilizes Around EUCLID"]

[Text] Five of the top names in European defense industries—Aerospatiale, British Aerospace, CASA, MBB, and Aeritalia—have just reached an agreement in principle for cooperation within the framework of the European Community technology research program EUCLID (European Cooperation for the Long Term in Defense). This agreement, which should be endorsed by the governments, confirms the desire of European industries to enlarge cooperation in the field of advanced technology. It should be recalled that the EUCLID program aims to disseminate scientific and technological know-how with a view to developing, in the long term, new defense products and systems. Those participating in the program are committed to developing proposals for cooperative projects and to developing the best conditions for the implementation of these projects, both on the level of organization and on that of technology and funding.

A Specific R&D Structure for Aerospatiale

For Aerospatiale, the indications are that the group will participate in all aspects of EUCLID, except in the field of submarine acoustics: radar technologies, silicon microelectronics, composite structures, electric guns, artificial intelligence, signature processing, components, optoelectronics, satellite surveillance technologies, simulators, and modular avionics.

Aerospatiale's management specifies that a specific structure will be set up within the R&D facilities of all its divisions and joint research center. Will the Euromissiles economic interest grouping, a 50/50 venture with the German MBB, be associated in one way or another with EUCLID? Aerospatiale points out that as the EC military research program covers all weapons applications, Euromissile will be consulted to define the potential applications in its areas of specialization which could be of benefit to research being carried out within EUCLID.

Status of FRG Participation in EFA Project Reported

90MI0321 Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN in German 27 Jul 90 pp 10-11

[Text] According to the FRG government it would cost between 4 and 5 billion Deutsche Marks [DM] if the FRG withdraws from the development of the European Fighter Aircraft (Fighter 90) weapons system as of November 1990, assuming that the partner countries

Italy, Great Britain, and Spain continue to participate. If all partners withdraw the costs would be from DM3.4 to 4.2 billion.

In March the coalition faction had demanded in a resolution motion that the FRG government look into the costs of withdrawal from the Fighter 90 project. According to the government, the German share in the development phase amounts to roughly DM6.4 billion if the joint program is continued. The government is relying on official as well as on industry estimates for this data. Agreements on principles and development require "detailed consultations" with the partner countries regarding the consequences of a withdrawal prior to formal announcement of such a withdrawal. The minimum duration of the consultations is three years. The withdrawing nation must live up to its obligations fully until expiration of the period of commitment, and it must bear all costs arising from the withdrawal. The government explains that the development program was concluded in May 1990. The government's handout goes on to say that the Fighter 90 will be equipped with mixed armament consisting of medium-range radar-guided missiles, short-range infrared-guided missiles, and a gun. No air to ground armament has been planned, and the Fighter 90 plane will not be capable of carrying nuclear weapons. As for valuable spinoffs of the research findings, the handout says that the "innovation effect" of combat plane construction reaches a multitude of different disciplines and industrial branches via basic research, applied research, and engineering sciences. Those profiting from it are, for example, electronics and process technology, automobile, engine, reactor, and power station construction, and medical technology. According to the Government, no dual developments occur in this project [as published].

FRG: Dornier Radar Measurement System Presented

90MI0323 Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN in German 27 Jul 90 pp 16-17

[Text] Following comprehensive research into demand and requirements in Europe and the United States, the German Aerospace subsidiary Dornier GmbH has built and recently put into operation, a radar cross section (RCS) measurement system equipped with the latest in high-frequency engineering for future radar technologies. Many years of experience in the development and manufacture of radar antennae, radomes, pulse radar systems, and radar signature technologies for both aerospace and defense engineering had demonstrated the urgent need to build a modern antenna and radar measurement chamber for future requirements in Friedrichshafen. This was also in line with the trend toward concentrating future activities within the Aerospace group.

The measurement chamber, which is completely lined with wedge-shaped microwave-absorbers and measures 530 m^3 will be used to perform tasks such as measurements to establish the radiation behavior of new antennae or the radar backscatter cross section of scattering bodies such as aircraft or satellites. The field emitted from an exciter antenna system (feed system) is beamed by two reflectors installed in the chamber in such a way that a steady wave with almost homogeneous amplitude and phase distribution is created in the spatially limited test zone (quiet zone). Using the two reflectors, the echo signal reflected by the object being measured is picked up again by the feed system in concentrated form. The objects to be measured are mounted on a height-adjustable turntable in the middle of the chamber. It is positioned in such a way that the body being measured can be rotated within the quiet zone. It is therefore possible to position the object to be measured at various angles of aspect and examine its directional backscatter and radiation behavior. The microwave absorbers mounted on all the walls of the chamber suppress interference signal caused by multiple reflections in the chamber, which would considerable affect the results of the measurements. The new equipment can be used to carry out measurements and analyses such as antenna radiation diagrams, radome characteristics, backscatter cross sections, and two-dimensional radar images. The advantages of this compact measurement chamber, as opposed to working in open conditions, are that measurements can be carried out free from interfering external reflections and the results can be reproduced at any time under identical conditions.

As well as providing services for various sectors within the German Aerospace group, the equipment is also available for use by outside customers. The main areas of application will be aviation (e.g., antennae for on-board and ground systems and the measurement of radar backscatter cross sections), defense engineering (e.g., measurement of radar signatures and reconnaissance and verification sensors), and space travel (e.g., SAR [synthetic aperture radar] imaging radar systems).

Advanced Weapons Systems Shown at Satory 90

90WS0059B Paris LE MONDE in French 26 Jun 90 pp 1, 25

[Article by J. Isnard: "The End of the Gun Merchants"]

[Text] In order to halt the decline of arms sales, France enters a race for quality symbolized by the 12th Satory Exposition

This "Satory-90" bears no resemblance to any previous land weapons exposition held since 1967, when the then-current government, realizing that exports accounted for less than 5 percent of the sales of the manufacturers involved, decided to promote weapons production in France. Within a few years, the "fallout" was visible: more than 1,800 armored vehicles of various types exported between 1971 and 1977 and some 95 billion francs (1988 value) in export sales from 1984 to 1988.

Then the decline gradually set in, and not just for French suppliers. Even the Soviet Union and the United States, by far the top exporters to third world countries, saw a comparable drop in their own sales. The only exception: West Germany, whose sales increased.

The massive, market-saturating purchases of previous years, debt problems, the drop in oil prices and raw materials prices that depleted the treasuries of potential clients, the end of the Iran-Iraq conflict, the fluctuating exchange rate of the dollar, which is still the currency of reference in weaponry, all acted as brakes on the development of the international arms trade.

French manufacturers were no exception to the general rule. That's why this 1990 get-together at Satory (Yvelines) was held by the industry as a revival, rather than its swan-song.

For the first time in 23 years, the show is open to exhibitors other than the French. The "Franco-French" era is over; the show also includes equipment developed through industrial cooperation between French companies and their European partners from NATO, as if to demonstrate France's desire not to remain isolated.

And for the first time, the exposition puts the accent on systems. It's the end of the era of the "gun merchants", a time when the sector was dominated by mechanical manufacturers producing vehicles (60 percent of sales) and weapons (40 percent).

Today, the same equipment has been transformed into integrated, "intelligent" weapons systems activated by the coordinated use of commands, monitoring, fire control, automation, computerization, and user-command dialog that shorten action time, increase the mobility and even the autonomy of the components in the field, and permit continuous combat, night and day, in all kinds of weather.

GIAT Resurrected

"Satory-90" has its own way of illustrating this twofold development. First, with respect to European cooperation, the French-German Tiger combat helicopter, represented by a full-size model and also offered in the United Kingdom. As for technological innovation, there's plenty of it, from the Leclerc tank, a veritable electronics and computer station on tracks at a price of 29 million francs each; to the SIC (information and communication system) program, which resembles "chips" that will handle operations at various levels of command; and including the Super-Puma Orchidee helicopter, which participates in the information loop in the field.

The symbol of this resurrection at Satory is the presence of France's new GIAT (Groupement industriel des armements terrestres) [land weapons industry group], a State-administered group that will next week become a national enterprise along the same lines as Aerospatiale, with as much freedom to move, trade, and make international agreements as an arsenal can have once it loses its state-assisted habits.

From this standpoint, GIAT has already provided an idea of its ambitions. Long kept in the background of progress, which made it miss the turn towards missiles, GIAT, with 14,300 employees and a modest sales figure of 7 billion francs showing an annual loss of 500 million francs, is in search of an identity. It is now establishing relations with Rheinmetall of Germany or with Royal Ordnance of Britain. It has the weapons activities of Manurhin or Luchaire in France under its wing. It is converting to the civil side of the field. And its new management admits that GIAT cannot achieve this revolution unless it is assured that the State will keep its promise to order the Leclerc tank from the company.

Second-Hand Equipment

And that's what hurts. Military markets, be they domestic or foreign, could become less and less consistent over the coming years.

The Vienna negotiations on the East-West disarmament in Europe are having their ups and downs. But unless some renewed rigidity on the part of the Soviets jeopardizes everything for years, the Europeans are headed for a reduction in land weapons that will be more quantitative than qualitative and more drastic in the East than the West (because of the flagrant imbalance that has existed since the beginning).

Such an event has two consequences. First: France will follow this movement with a 10 to 15 percent reduction in the current volume of weapons and the military planning law will ultimately result in a drop in the "envelopes" devoted to financing the research and development of the equipment (tanks, armored vehicles, artillery, and helicopters) limited by the Vienna treaty. Second: Soviets and Americans alike—against the interests of their French rivals—will surely offer the abundant used equipment they have had to withdraw from Europe for sale at prices defying all competition, as the United States has already done by flooding Egypt and Morocco with M-60 tanks for practically nothing.

The DGA realizes that a difficult time is coming. Vienna is a challenge: "Once the current goal of numerical parity is reached, where would stability in Europe be," they say, "if we were unable to counter a potential adversary with anything but weapons with an undeniably inferior operational capability? There is still a risk of a qualitative imbalance just as destabilizing as before."

This race for quality includes equipment such as the means of gathering, transmitting, and processing data, which are used for weapons control and would make it possible to see if the USSR has threatening military capabilities hidden elsewhere than in Europe. In this vein, France is in a pretty good position.

FACTORY AUTOMATION, ROBOTICS

French Firm Designs Programmed Welding Machine

90WS0068B Paris L'USINE NOUVELLE in French 21 Jun 90 pp 63-64

[Article by Alain-Gabriel Verdevoye: "Main Targetet Market: The Automobile; Welding Adopts Numerical Control"; first paragraph is L'USINE NOUVELLE introduction; passage in boldface as published]

[Text] **Advantages: consistent quality, enhanced precision, improved productivity. One drawback: its price.**

In 1991, the French specialist of resistance welding, ARO, will market its first NC [numerical control] welding machine. This revolution in welding was achieved simultaneously by this small to mid-size business of Chateau-du-Loir (Sarthe) and the German Heln which is also working on a similar technology. This new machine, which ARO has been studying jointly with Peugeot since 1985, was introduced at the Internal Welding Show of Essen (Germany) in September 1989; by 1995, it could account for one half of the company's automotive sales. As it happens, the automobile industry is the largest client of ARO (Fr250 million in sales; 350 employees) which thus hopes to increase its present 50-percent share of the French market for resistance welding equipment.

"The NC welding machine is of interest to all those who need consistent welding quality," we were told by Didier Lombard, the company's chief executive officer. In fact, the machine, which is equipped with an electric motor instead of a jack, makes it possible to actually synchronize the position of the electrodes and the welding force. As a result, actual welding starts only when the programmed force has been reached, so that the tightening operation leaves only a minimum impact mark on the sheetmetal and electrodes. Hence a better appearance of the welded sheetmetal and a reduction in electrode wear, and therefore in the mechanical fatigue of the machines, which means more consistent weld quality. With a numerical control, the depth of penetration of the electrodes into the sheetmetal can also be measured with very high precision, and therefore effectively controlled.

This new welding machine also generates obvious productivity gains. That is because the possibility of programming optimum electrode opening movements and achieving good synchronization between grip and robot will shorten the welding cycle. The only drawback of numerical control is that it sells for much more than compressed-air machines. However, according to Didier Lombard, the savings resulting from not having to buy compressed air would make the machine profitable after two years.

FRG: BMFT's CIM Subsidy Program Reported

90MI0241 Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN in German 28 May 90 pp 3-4

[Text] The growing transformation of the supplier's market into a buyer's market is obliging industries to improve their responsiveness to consumer demands. Manufacturing industries are facing the task of incorporating the characteristics of a service industry. Information technology is becoming an important component of the production process. Information as an important factor in production is acquiring new meaning and significance.

Consequently, an essential part of the BMFT [Federal Ministry for Research and Technology] program, on "Manufacturing Technology 1988- 1992," focuses on the field of computer-integrated manufacturing (CIM) and thus on an innovative process which, above all, calls for the solution of the following problems:

- Linking operational departments with information technology,
- Optimizing entire production processes,
- Integrating work processes and creating integrated work operation,
- Changing organization and management,
- Arranging the best possible interaction of man, technology, and organization.

The Federal Ministry for Research and Technology has earmarked about 370 million Deutsche marks [DM] for the following measures for the 1988-1992 period.

Wide CIM Technology Transfer

The goal of this measure is to provide a practical and clear demonstration and presentation of the advantages, problems, as well as the possible CIM arrangements and solutions to potential users, primarily to small and medium-sized companies. In this way they will be able to prepare their managerial decisions on the basis of solid know-how.

The BMFT has therefore started an initiative to speed up the transfer of pertinent research institutes' expertise in the CIM field. Meanwhile, institutes at 16 locations have begun operating as CIM- technology transfer points. In 1989, 211 meetings were held with a total of 4,491 participants.

The BMFT has allotted a total of approximately DM46 million for this measure for the 1988-1992 period.

Standardization in the CIM Field

Since CIM is necessary to integrate the extremely different manufacturing technology, components and equipment that are offered by various manufacturers, standardization is particularly important. The rapid

development in information technology must be accompanied by a corresponding development in standardization.

A CIM work group for standardization was set up with BMFT funds; this should strengthen the scientific foundation for CIM standardization in the FRG. The work of the group, in which several institutes cooperate, is technically associated with, and evaluated by the Technical Advisory Council of the CIM Commission in the DIN [German Standards Institute] in Berlin, which is made up of experts from industry and science as well as from the relevant standards committees.

The BMFT has allotted a total of approximately DM20 million for this measure for the 1988-1992 period.

Indirect-Specific Subsidy of CIM Applications

The objective of this measure is to stimulate the rapid application of computer-integrated manufacturing. This subsidy is targeted for companies that produce manufacturing equipment, machines, and plants. A simplified application, approval, and accounting procedure is used for this subsidy that should make funding more readily available to small and medium-sized companies.

Industry has already responded to this offer of funding. The approval phase had to be concluded as early as July 1989 because the entire DM300 million in funds earmarked for this project had been allocated.

Subsidies were granted to 1,231 companies. Approximately 92 percent of the subsidized companies have less than 1,000 employees and 93 percent have less than 500. It was therefore possible to attract principally small and medium-sized manufacturing industries.

Number of Employees	Number of Companies (percentage)	Funds Approved (percentage)
up to 100	44	38
101 to 500	39	42
501 to 1,000	9	11
1,000 to 2,000	5	6
more than 2,000	3	3

FRG: University Develops Mobile Robot System

90MI0291 Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN in German 15 Jun 90 pp 8-9

[Text] After years of research and development work, the Institute of Process Computing Technology and Robotics at Karlsruhe University has completed a robot system that represents a major achievement in artificial intelligence. The KAMRO, or "Karlsruhe Autonomous Mobile Robot," as it is known, not only moves independently within its environment from one assembly point to another, but it is also capable of autonomously assembling individual components with its two "hands" to form a workpiece. If the requisite components are lacking at the assembly point on which it is homing, KAMRO can "collect" them en route.

The project focuses primarily on the creation of an autonomous system. The resulting robot system is capable of performing a task with a certain degree of autonomy and "intelligence," without human assistance.

The KAMRO robot system was designed especially for industrial production. It consists of mobile platform on which two manipulators ("hands") are mounted. The robot's "hands" consciously imitate human anatomy and contain a large number of sensors. In addition, KAMRO has an "eye" in the form of a videocamera, as well as several touch and contact sensors. These sensors enable the robot to carry out extremely delicate operations on objects. The system's "legs" consist of four novel Mecanum wheels that give KAMRO a mobility never previously achieved. For example, the robot can turn on the spot or proceed sideways in any given direction.

The robot's job is to assemble a quantity of workpieces into a finished product according to a preestablished "construction scheme." Once set in motion by an order to proceed, KAMRO autonomously homes in on the assembly point where the required parts have been deposited. If the parts are not at the assembly point, the robot must go to the warehouse and collect the parts itself. As the only basis KAMRO has for its workpiece assembly task is the construction scheme for the finished product, the robot autonomously decides on the strategies whereby the parts can be grasped and assembled. The main priorities are that KAMRO must recognize where and how the parts are deposited with its "eye," and that it must be able to rely on its sensitive touch during workpiece assembly.

Further information may be obtained from Andreas Hoermann, Institute of Process Computing Technology and Robotics, Karlsruhe University, tel. 0721/608-4252.

LASERS, SENSORS, OPTICS

FRG: New Eureka Laser Initiative Presented

90MI0295 Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN in German 29 Jun 90 pp 8-9

[Text] The development of industrial lasers with constantly increasing beam power and the widening of their area of application to cover a large number of new classes of materials have created the need for action on laser safety. Laser processing of plastics, composites, wood, and some metal alloys, and laser treatment of organic tissue can generate toxic and carcinogenic substances. Handling lasers also necessitates taking preventive labor and health protection aspects into account when developing techniques.

It is not enough to analyze the risks posed by the introduction of new technologies and the exploitation of

the opportunities that they offer. It is far more important to carry out concrete research into their undesirable consequences and side effects, and this is the objective of a new EUREKA [European Research Coordination Agency] joint project on laser safety, for which the BMFT [FRG Ministry of Research and Technology] has set aside 7 million Deutsche marks from 1991 to 1994.

Preliminary studies carried out by the Federal Institute of Labor Protection in Dortmund, the Hanover-based Laser Center, and the Fraunhofer Institute of Production Technology in Aachen have highlighted a whole series of problem areas, which will be addressed at the European level on an interdisciplinary basis by laser scientists, toxicologists, physicians, ergonomists, and the relevant industrial sectors. The results of this research will be converted into rules and guidelines on which to base the developments.

The EUREKA initiative is the ideal framework for this complex research work and for achieving an early conversion into international standards. Indeed, regulations on health, safety, and other welfare- related matters will have to be harmonized by the time the single European market comes into being in 1992 at the very latest.

A EUREKA industrial conference will be held at the Laser Center in Hannover on 30 and 31 October 1992 to lay the foundations for international cooperation. Laser scientists from the GDR are also expected to attend this event.

Further details on the EUREKA joint project on laser safety and the EUREKA industrial conference will be found in the Federal Gazette (No.111/90) or may be obtained free of charge from the Technologie Nachrichten editorial office. Additional information may be obtained from Dr. Hartmann and Mr. Nowitzki c/o Laser Safety Project Management, VDI Technology Center, Graf-Recke-Str. 84, 4000 Duesseldorf 1, Tel: 0211/6214-401.

Italian Institute's Laser Research Described

90MI0309 Turin MEDIA DUEMILA in Italian Jun 90 pp 85-89

[Excerpt] [Passage omitted]

The second FEL (free electron laser) was built at ENEA [National Committee for R&D of Nuclear Energy and Alternative Energy Sources] in Frascati, where it has been in operation since 1985, fed by a microtron accelerator that generates a beam of high-energy electrons. This laser's main feature is that the wavelength of the radiation emitted can be continuously varied. The electrons pass through a spatially alternated static magnetic field, so the oscillations to which they are subjected can be adjusted to give practically all the frequencies that may be desired.

"We are also testing a new (more powerful) version of the FEL with a view to obtaining actual applications for the free electron laser, on which little other than basic research has been carried out since 1976," says Alberto Renieri [director of ENEA's department of advanced technology development], "and above all we are working on the frequencies (from medium infrared, typical of carbon dioxide lasers, to far infrared) of greatest interest to industry."

There are in fact processes for producing special materials that require a specific wavelength, such as photodeposition or synthesizable powders (which can be heat-compressed). For example, high-purity ceramics may be obtained with the carbon dioxide laser, because granulometric inspections and high-precision doping can be performed. So imagine how many new applications will come about once we can obtain a practically infinite range of wavelengths." Nevertheless ENEA is studying and developing other lasers with extremely interesting features. "In connection with the EUREKA [European Research Coordination Agency] project, we are also working on an excimer laser (special molecules obtained by exciting the atoms of a noble gas in the presence of a halogen) with an average power of one kilowatt, which we intend to double at a more advanced stage in the project. Excimers are ideal for reaching such high powers at full efficiency," points out Alberto Renieri. "As they use noble gases the problem of the ground state does not arise because, for example, xenon chloride molecules split by themselves as soon as they decay, and there is therefore no ground state!"

Other lasers, called "color center" (because each has a characteristic color), on the other hand, possess by their very nature one of the highest spectral purities in absolute and are of particular interest for use in spectrographic studies. In fact, all lasers, display a very narrow spectral line, but none presents a single wavelength. "However, approaching the point where models that were regarded as mere ideals until yesterday can be achieved. Some atomic processes," Renieri points out, "produce a solitonic wave. They are quantic phenomena for which there is no classical analogy." In other words, if we accept a laser with a "crazy" frequency band, it will be possible to obtain squeezed states that will confine the radiation in a single wavelength. A sophisticated microscope based on a quantum well laser and with the characteristics just described has been constructed recently in the United States.

In the optics and electro-optics sector, ENEA's primary task is to study new component design and production technologies, to develop systems that utilize laser sources for the various types of applications, and to develop special, or at least not commercially available, types of source (with particular attention in all these cases to the issues surrounding the energy and environmental sectors). The FTU (Frascati Tokamak Upgrade) is also in operation at Frascati, is and will produce the high-density, extended confinement, high- temperature plasmas that the EEC recognized in 1983 as a "priority project" under the European fusion program. Its parameters are being used in studies of direct interest for the

future fusion reactor (Next European Torus, which will be built in the Federal Republic of Germany under the direction of Romano Teschi, former director of ENEA's Fusion Department at Frascati). Renieri's department has already submitted to Euratom the feasibility studies for the construction of a continuous wave free electron laser with a multimegawatt output, powerful enough, therefore, to heat the deuterium and tritium ions to plasma ignition point.

As far as environmental monitoring instruments are concerned the newest arrival at Frascati which entered operation at the beginning of this year) is the Lidar, a carbon dioxide laser mounted on revolving turret (which will eventually become mobile), by means of which the atmosphere can be analyzed to an altitude of 3-5 kilometers.

With the Lidar basically an optical radar, the radiation reflected by its two rays is analyzed and (as the precise coordinates of the points under examination are known) the quantities of a specific chemical agent present in the atmosphere can be determined immediately. In fact, it is sufficient to tune one of the beams of light emitted by the Lidar to the wavelength known to be absorbed by a given chemical agent to detect its presence; the amount of light absorbed will show the density of the particles making up the substance sought; the moment at which the oscillograph picks up the reflected radiation indicates the altitude at which measurement is being made, and, finally, comparing the absorption with the control beam (kept out of resonance) will determine precisely how much light was dispersed owing to chance atmospheric phenomena such as turbulance. Other laser applications of great interest are already possible, including the analysis of holographic images of real objects. In fact holographic interferometry (a technique in which systems are also subjected to thermal or mechanical stimuli) makes it possible to identify in the hologram characteristics of the object under examination that would otherwise be imperceptible, such as imperfect welds on an aircraft wing or the crack points in the Lysippus Horse in the Capitoline museums.

"What we have to do now," concludes Renieri, "is make many of these lasers lighter and easier to handle, because wherever there are complex and sophisticated instruments like the Tokamak, a team of research workers is likely to be on hand to operate the lasers, but submarine crews cannot be expected to have the skills that would immediately enable them to operate systems that would be highly innovative if installed on their ships today. To this end, ENEA's five-year "Optical and Electro-Optical Technologies" plan takes account, on a complementary basis, of similar studies conducted at CISE, Selenia, and CNR [National Research Council].

MICROELECTRONICS

EC Commission Selects New ESPRIT Projects

90AN0380 Paris ELECTRONIQUE HEBDO in French 14 Jun 90 pp 1, 62

[Article signed P.A.: "ESPRIT Filling Out"]

[Text] A call for proposals was sent out on 10 January in the framework of the European Strategic Program for R&D in Information Technologies (ESPRIT), as a result of which 450 files piled up on the desks of ESPRIT officials. The decision has been made: The Commission selected 107 new projects, including three that are part of the 18-month launch phase of the Joint European Submicron Silicon Initiative (JESSI). In addition to these 107 projects, 43 exploratory actions—in particular workshops, demonstrations, and studies—will be started in order to attract more small- and medium-sized companies to the ESPRIT program. The total cost of these projects—whose length rarely exceeds three years—will probably amount to about ECU 690 million, half of which will be financed by the European Community.

Apart from the three JESSI projects, 40 percent of the selected projects concern computer systems, 33 percent deal with computer-integrated manufacturing (CIM), and the rest involve office systems. More than one-third of all research under these projects will be handled by small- and medium-size companies.

Several projects focus on "neurocomputing" or neural networks, which are considered by some as the emerging data processing technology for the 21st century.

One such project is "Neurocomputing," in which Thomson-CSF (project manager) is cooperating with Philips, Siemens, and others.

Parallel, fault-tolerant architectures are also the subject of several projects, such as the "Fault-Tolerant Architecture with Stable Storage Technology" project, which unites the German companies Stollmann and Daimler-Benz and the French company Bull. The "hot" data processing topics are also tackled: object-oriented languages and programs, voice and character recognition, etc.

Thomson-CFS Develops 3-D Stacked Chips

90AN0286 Paris ELECTRONIQUE HEBDO in French 29 Mar 90 p 27

[Article by Frederic Fassot: "Stacking Chips: A 500-to-800-Percent Silicon/Substrate Ratio"]

[Text] Thomson-CSF/DCS has just developed a three-dimensional (3-D) interconnection technology by stacking bare standard chips and interconnecting them on the four sides of the cube thus created.

What more can be required from an interconnection technology than that it allows the highest possible density, uses standard chips which do not need additional

processing (such as bump formation, for instance), allows pre-assembly testing of individual chips, and that it has excellent electrical and thermal characteristics? Thomson-CSF/DCS has just developed a truly revolutionary technology that meets all these requirements. This technology can reach 500-to-800-percent silicon/substrate surface ratios by stacking bare chips encapsulated in epoxy resin. A ratio that by far exceeds those obtained at interconnecting dual-in-line (DIL) packages on printed circuits (from two to five percent) or for producing hybrid modules from bare chips (20 percent). It should however be mentioned that Thomson has not yet certified this technology; only its feasibility has been proven.

In order to improve silicon/substrate ratios significantly, two dimensional chip mounting on XY planes, which cannot exceed a 70-to-75-percent ratio, even in optimal conditions (wafer-scale integration), had to be abandoned. The approach chosen by Thomson-CSF to increase the density of memories, microprocessors, and cache memories is not based on wafer-scale integration; it uses standard chips that can be produced either in small or large batches.

Interconnection at the Four Lateral Sides

The Thomson design consists in stacking chips which are bonded to each other and interconnected at the four lateral sides of the cube thus formed. The interconnection process involves six manufacturing stages.

First, a thin film identical to a tape-automated bonding (TAB) tape is used for the first interconnection level between the chip and the film by gold-wire bonding. It should be noted that this technique does not require the output of the chip to be linked to the corresponding contact on the tape. Thus, for memory circuits whose input/output (I/O) devices are located at the two smaller sides of the chip, parts of the two larger sides can be used to increase the interconnection distance [pas d'interconnection] if necessary. This technique can be compared to a "false TAB." It preserves all the advantages (testing and burning-in of chips before mounting, automatic assembly) without the inconveniences (the need to increase the bumps on the I/O devices, cost of TAB tape, which is inversely proportional to the size of the interconnection distance, etc.). Chips thus fixed to the tapes are then electrically and individually tested. They can also undergo a burning-in process. The film/chip assemblies are then bonded one on top of the other with an insulating epoxy resin. This stage requires meticulous alignment of the stack, for which the perforations on both sides of the film are very helpful. After polymerization of the stack (Thomson stacks eight static random-access memories (SRAM's)), a cube is obtained. The cube's four lateral sides must then be cut at approximately 100 micron from the edge of the widest chip, to remove redundant film. Thus, sections of the gold wires used for bonding the I/O devices of the chips network lay bare on the four lateral planes of the cube. These sections usually have a diameter of 39 or 25 micron. The height of the cube depends on the number of stacked chips and their thickness (usually 0.5 mm) and that of the glue between the chips (usually 0.1 mm). So, a cube containing a stack of eight chips would be 4.2 mm high, while one containing eight 0.1-mm chips would be 1.4 mm high.

25-Micron "Insulating" Tracks

Different methods are used to interconnect the chips. They are selected according to different criteria: the number of I/O devices and/or the distance between the contacts, the types of applications, the production volumes, etc. One cube interconnection method uses a laser: The cube is completely metallized in a vacuum or chemically; using a laser, certain sections are etched out to provide insulation and achieve the required interconnection. Thus, 25-micron wide tracks can be made. A second method uses photolithography to achieve the interconnect pattern. This technique, named "lift-off," consists in vacuum-depositing thin films of conductor materials (NiCr + Au) on a photosensitive resin; 10-to-50-micron conductors can thus be obtained. This method is destined especially for the interconnection of chips with a large number of I/O devices (microprocessors, application-specific integrated circuits (ASIC's), etc).

In the final phase, the cubes prepared in this way may be encapsulated in standard or specific packages. Multicube configurations which encapsulate serveral cubes in a single package are also possible. This configuration is most interesting for memory chips. The choice of substrate depends on the power to be dissipated. Aluminum nitride, silicon, aluminum oxide: The choice is vast.

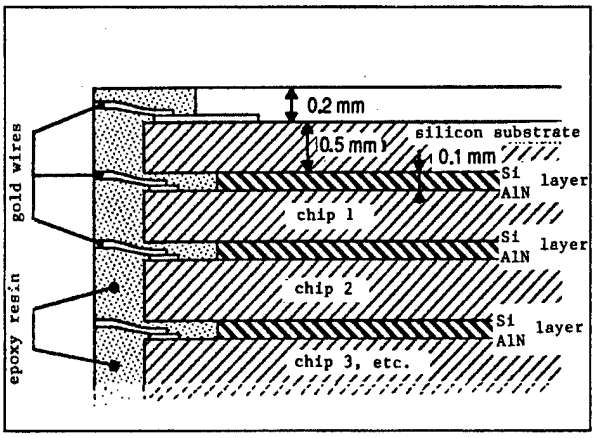
Yet, this extraordinary density does not at all impair the electric and thermal performances. An eight-memory cube contained in a leadless ceramic chip carrier (LCCC) package with 36 I/O devices has been tested using "Promthe" thermal simulation software. Each chip dissipated 0.5 W, and the maximum difference between junction and substrate temperature reached 35 degrees Celsius when all the chips were working at the same time. The difference between the hottest and coldest chip was 11 degrees Celsius. The electrical performance of 3-D stacking is practically unequalled. The interconnection distances between chips are 0.6 mm, against 10 to 20 mm for flat structures. This enables reductions in propogation delays. In a cube containing eight 256-k SRAM's, noise is thus reduced by a factor of 100.

This technology, whose costs are comparable to those of hybrid technology, can possibly be used for (static and dynamic RAM's, electrically erasable programmable read-only memories (EEPROM's)), microprocessors with associated cache memories, etc. All that remains now is to certify and industrialize the technology.

Footnote

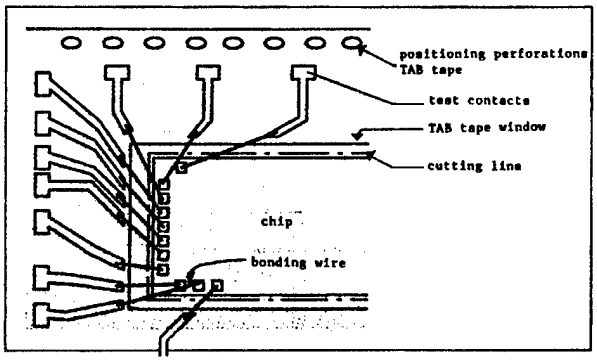
This technology was presented during the Hybrid 90 forum.

Figure 1. Cross Section of the "3D" Cube



Eight to ten chips can thus be stacked

Figure 2. Chip Interconnection on Pseudo-TAP Tape



Each chip is interconnected on a pseudo TAB tape by gold-wire bonding

FRG: JESSI Progress Reported

CAD Project

90MI0290A Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN in German 29 Jun 90 p 14

[Text] The JESSI CAD Frame Project, the first, central CAD [computer-aided design] project of the JESSI [Joint European Submicron Silicon Initiative] program, has been launched under the auspices of ESPRIT [European Strategic Program for Research and Development in Information Technologies]. The objective of the development project is a uniform operational framework for all CAD tools, which will serve as a foundation for an effective software infrastructure for the creation and administration of integrated CAD environments. Special importance is attached to the creation of a common software basis for all other JESSI and ESPRIT CAD projects. The JESSI CAD Frame Project will thus play a key role in further improving circuit design and programming. It will not be restricted solely to electronics but will also support other design automation projects. The software will be issued in a series of graduated versions, the first of which is expected in July 1991.

The launch phase of the CAD Frame Project will be financed out of ESPRIT funds, and will cover applied framework research, framework development and support, framework evaluation, and requirement engineering and future planning. More than 100 experts will work together on this project, which has a budget of about 30 million Deutsche marks [DM] for the first 15 months.

The project is supported by all the major semiconductor companies, including Siemens, Philips, and SGS-Thomson. It will incorporate these companies' know-how and exploit the specific experience of companies and institutes such as CADLAB, the Swedish Institute of Microelectronics, TeleSoft, the Technical University of Delft, ICL [International Computers Limited], and FZI [Computer Science Research Center], Karlsruhe. Nixdorf and CADLAB are coordinating the project.

Cooperation With JEMI France

90MI0290B Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN in German 15 Jun 90 p 12

[Text] The JESSI subprogram on equipment and materials has acquired an important addition: JEMI (Joint Equipment Manufacturers Initiative) France in Grenoble, which was founded recently, is represented on the JESSI subprogram board by its president, C. Doche. Doche formerly represented LETI [Electronics and Computer Technology Laboratory] as spokesman for small and medium-sized companies in France.

The objective of JEMI France is to provide manufacturers of production equipment and materials for the semiconductor industry with a common platform for the expansion of their business. JEMI France supplies its members with information about current microelectronics programs (such as JESSI and SEMATECH), promotes know-how transfer among them, commissions market surveys, and grants support for new development projects. Non-French companies may also join JEMI, provided they maintain research and manufacturing facilities in France and there are no conflicts of interest with French companies. Its members include manufacturers of wafers, masks, gases, and chemicals, and producers of chip-production machinery, chip-testing equipment, and automation machinery.

FRG Firm Presents Submicron Diagnostic System

90WS0068A Paris L'USINE NOUVELLE in French 21 Jun 90 pp 63

[Article by Philippe Deroin: "Integrated Diagnostic System for Submicron Circuits; Instruments Comes Before Innovation"; first paragraph is L'USINE NOUVELLE introduction; passage in boldface as published]

[Text] **With its new IC [integrated circuit] diagnostic system, Schlumberger is targeting the microelectronic products of 1995. And it shows the integration level achieved by instruments.**

As if to echo the increasing complexity of industrial products, measuring and control instruments are undergoing a technological revolution. Not long ago, they were unattractive assemblies of signal acquisition and processing components; now, they must offer advanced functions and ease of use.

Moreover, their market consists of businesses engaged in a competition where product marketing lead times keep getting shorter. Therefore, instrument manufacturers must offer today the measuring and control systems of tomorrow, which means that they must master the corresponding advanced technologies.

This is shown in an exemplary manner by Schlumberger Technologies with its new electron-beam testing system designed for fault diagnostic and performance testing during the development of submicron ICs (memories, ASICs [application-specific integrated circuits] or gallium arsenide high-speed circuits).

The threshold has already been crossed with 4-Mbit DRAMs [dynamic random-access memories] which achieved line widths of less than 1 micron, but Schlumberger's IDS-5000 reaches a precision of 0.2 micron. However, the corresponding products will be available only in a few years. They will include the 64-Mbit memories on which IBM and Siemens are working, which could be introduced around 1995.

Yet, testing and diagnostic material for such products (which will sell in considerable quantities but over a short period) must become available well ahead of time. Any delay is suicidal. But it takes Fr600,000 and 1-1/2 month to redo a set of masks for a complex circuit.

At first sight, the new IDS is not much different from its predecessors, which account for 60-70 percent of the worldwide inventory estimated at 150 units. We should add that it is intended for a few handfuls of businesses and that it costs about Fr3.5 million. To users, the IDS looks like a Sun workstation with a graphic interface with parallel management of electronic diagrams, actual circuit drawings, scanning electron microscope images and the measured signal. Schlumberger work on this graphic interface is also the subject of more extensive developments under its joint-venture agreement with the Japanese NTT.

The key to user friendliness is the transparency of the technology used. Yet, compared with traditional micropoint stations, there has been a marked advance. These stations perform a measurement by contact, using a needle which is at best 4 micron in diameter and involves a risk of coupling with the circuit: the parasitic capacitance can reach 1 picofarad, the order of magnitude of possible couplings between two circuit lines. The very couplings which one wants to identify.... With the electron beam of the new IDS, the "probe" has a diameter of only 80 nanometers, and the coupling effect is 1,000 to 100,000 times smaller.

To achieve such precision, a new electron source had to be found, as tungsten had too many limitations. The electron gun therefore uses lanthanum hexaboride and integrates the technology required to ensure a correct lifetime (2,000 hours in operation) of this very fragile material.

As a result, a third vacuum stage with an ion pump had to be added to the system and the electron gun had to be rethought, replacing metal with ceramics and redesigning the optic column so it could withstand high pressure differentials (since the gun itself works at 10^{-9} bars). Many improvements were also made, e.g., in the instrument mechanism and in the surface finish of the vacuum chamber where samples are tested.

Of all this, however, the user sees only functionalities. Besides, the IDS is called an integrated diagnostic system. "We could have called it a scanning electron microscope," Xavier Larduinat of Schlumberger Technologies explained, "although it is more than that. But the essential point is that the instrument concept will remain valid for future versions, which may well not use scanning electron microscope technology..."

Netherlands: Philips To Discuss JESSI Participation

90P60069A Rotterdam NRC HANDELSBLAD in Dutch 1 Sep 90 p 21

[Article: "Parliament Discusses Chips With Philips"]

[Text] Members of parliament from the governing parties have reacted with alarm to yesterday's revelation in this paper that Philips will cease production of static memory chips and will withdraw from one of the most important subprojects of the European technology program JESSI [Joint European Submicron Silicon Initiative].

Next week, the politicians will ask Philips to outline the chip group's reorganization. That will occur during a discussion with Philips that had been requested earlier by the parliamentary Permanent Committee for Economic Affairs regarding the announced restructuring and financial problems of the firm. The implications for Dutch employment and technology policy will also be discussed. PVDA member H. Vos would not comment on the outcome of the discussion.

CDA leader J. van Iersel said, "I am very disappointed that Philips is reducing its contribution to Europe's most important technology project." He called this "a bad thing from the national point of view." He stated that Philips had assured him that it would continue with other important chips and that it would not allow itself to become dependent on its competitors for components.

In the near future, van Iersel will discuss the implications of government support for JESSI with the minister. He believes there must be an attempt to continue the Netherlands' relative contribution to JESSI to the extent that it is possible. That can happen if other Dutch participants in the technology program can be given more support with the money saved from the contribution to Philips.

The Dutch government has also spent 200 million guilders on the so-called Megaproject, JESSI's forerunner. Within the framework of that huge alliance, Philips and Siemens developed the process technology for the latest generation of chips.

Netherlands: JESSI Funding Questioned

90AN0290 Amsterdam COMPUTERWORLD in Dutch 4 Apr 90 p 1

[Article: "JESSI Funding Still Unsettled"]

[Text] The Hague—Financing of the Joint European Submicron Silicon Initiative (JESSI), which will cost 8 billion guilders, is still up in the air. This is also the case with the Dutch contribution.

Over the next seven years, the Netherlands will have to contribute 400 million guilders for the program. Minister of Economic Affairs J. Andriessen has told a select committee meeting of the Second Chamber that he has not yet budgeted for this amount of money. In any case, a majority of the committee would not have agreed because, at the moment, they have too little information about the project.

In the meantime, JESSI, which is to put the European chips industry in a position to compete internationally and, in particular, with Japan, has started off 21 projects as of 1 January this year.

For these projects, Andriessen has set aside 40 million guilders from other budget headings.

Participants are Philips, Siemens, and Thomson, who have joined forces to conduct research into the possibilities of production methods for submicron-level memory chips. According to the Minister, only their laboratories are suitable, but, at a later stage, small- and medium-sized enterprises will also be involved in JESSI. They will focus on the development of applications based on the new technology.

In this connection, he refuted criticism by the Second Chamber that giving money to Philips is becoming an automatism.

Andriessen expects the JESSI project to lead to results a year or two earlier than had been expected now that Siemens and IBM have decided to cooperate; he did not agree with fears expressed by Second Chamber members that knowledge gained through this cooperation would not be tranferred to other participants in the JESSI project, because this has been settled in clear agreements.

The Second Chamber members were satisfied with the outlines of the plan of action for microelectronics, which has recently been produced by the government and which, according to Andriessen, is to have a whiplash effect. There was criticism on the subject of information science research, which was said to have received second-rate treatment. Minister Andriessen will now request his colleague, Minister of Education and Science J. Ritzen, to release more funds.

SCIENCE & TECHNOLOGY POLICY

EC Research Council Evaluates Projects

90AN0388 Brussels EUROPE in English 30 Jun 90 p 8

[Report: "EC Research Council/Results: Programmes Adopted, Guidelines Defined"]

[Text] Luxembourg, 29 June 1990—The Research Council, meeting this Friday under the presidency of the Irish Minister of Science and Technology, Mr. M. Smith, and with the participation of Commission Vice-President Mr Pandolfi, obtained the results it hoped to achieve, which were as follows:

a. 1990/1991 research programme on analysis of the human genome. This programme, with an appropriation of ECU 15 million was definitively adopted.

b. 1990/1993 EURET programme in the area of transport. The Council adopted its common position to submit to the European Parliament [EP].

c. EUROTRA programme for the development of an operational system of automatic translation. The Council adopted the common position to submit to the EP.

d. Scientific and technological cooperation with third countries. The Council held a first debate on the Commission's communication. The ministers would like a more detailed analysis that includes a cost/benefits analysis and that takes into account the risk that exported Community technologies might be used later to inundate the Community with finished products.

e. Scientific and technological cooperation with the countries of Central and Eastern Europe. The Commission document must be expanded. Certain ministers think the general opening of EEC research programmes to these countries would be premature; priorities must be established, which could include human resources, the environment and nuclear safety.

f. Participation of Eastern and Central European countries in COST [Cooperation in Scientific and Technical Research] projects. The Council approved a resolution in favour of the gradual integration of these countries in COST, with certain objectives being respected.

EC Launches STRIDE Regional R&D Promotion Program

90AN0393 Luxembourg OFFICIAL JOURNAL OF THE EUROPEAN COMMUNITIES in English 4 Aug 90 pp 18-21

[Article: "Notice C(90) 1562/2 to the Member States Laying Down Guidelines for Operational Programmes Which Member States Are Invited To Establish, in the Framework of a Community Initiative Concerning Regional Capacities for Research, Technology and Innovation—STRIDE"]

[Text] 1. At its meeting on 25 July 1990, the Commission of the European Communities decided to establish a Community initiative concerning improvement of regional capacities for research, technology and innovation (hereafter called "STRIDE" [Science and Technology for Regional Innovation and Development]), within the meaning of Article 11 of Regulation (EEC) No 4253/88 and Article 3(2) of Regulation (EEC) No 4254/88.

2. In the context of STRIDE, Community assistance in the form of loans and grants is made available for measures and in areas which respect the guidelines laid down in this notice, and which are included in operational programmes submitted by the Member States and approved by the Commission of the European Communities.

I. Definition of Development Aims and Eligible Areas

3. The main aim of the Community initiative is to strengthen the research, technological and innovatory (R&TD) capacity of the regions whose development is lagging behind (objective 1) so that they are better placed to attract or retain technologically advanced activities in the productive sectors of the region and highly qualified personnel. Accordingly, most of the financial resources for STRIDE will be allocated to objective 1 regions.

STRIDE can also assist regions seriously affected by industrial decline (objective 2) by stimulating innovation in ways which encourage the diversification of the local economy.

STRIDE complements other Community actions in favour of R&D, especially those within the Community Support Frameworks (CSFs), the Community's R&TD framework programme and the SPRINT (Strategic Programme for Innovation and Technology Transfer) and COMETT (Community Action Programme in Education and Training for Technology) programmes, and will be coordinated with them. It is designed to increase the contribution that the Community's policies in favour of research, technology and innovation can make to achieving greater economic and social cohesion within the European Community.

4. STRIDE concentrates on three categories of measures, defined as follows:

4.1. In regions whose development is lagging behind (objective 1):

A. STRIDE seeks to encourage a wider regional disribution of research capabilities by helping public administrations in less developed regions assess technology requirements as part of their development planning, by helping them to audit local capabilities and potential, and to invest in the development of a long-term capability in selected areas of research, technology and innovation.

B. STRIDE seeks to improve the participation of research centres and firms in objective 1 regions in research programmes supported by the European Community as well as other international programmes, by improved awareness, supporting preparatory work, and by strengthening networks of cooperation within the European Community.

4.2. In regions whose development is lagging behind (objective 1) and in regions seriously affected by industrial decline (objective 2):

C. STRIDE encourages cooperation between research centres and firms, so that research carried out in the regions becomes more responsive to local needs, so that firms can meet a greater part of their requirements for assistance relating to the transfer and application of technology from local facilities and so that firms are stimulated to innovate and to employ highly qualified personnel.

II. Eligible Measures

5. In this section of the notice, a list of eligible measures under STRIDE is given, grouped under each of the categories defined in paragraph 4 above. When submitting operational programmes, Member States are expected to choose from this list a more limited set of measures on which Community assistance should be concentrated and which are consistent with the strategy for the development of research and technology in the regions. This choice should have regard, in particular, to the nature of the measures in favour of R&TD to be financed within the Community Support Frameworks, in relation to which STRIDE is a complementary action.

Category A

Strengthening Research Facilities in Objective 1 Regions

6. STRIDE may support the creation or development of a capability in a small number of fields of research, and for a small number of research centres including universities, to be jointly agreed between the Member State and the European Community. Priority is given to fields of

precompetitive research identified as being capable of enhancing the economic potential of the region.

Research directly related to the natural resources' potential and environmental conditions specific to the region or to regions geographically adjacent to it may also be envisaged. Thus, STRIDE may finance, in particular:

(a) Evaluations, including external evaluations by appropriate research bodies to identify the R&TD contribution which it is possible to make to the specific development requirements of less favoured regions; to determine the R&TD potential of research bodies in order to assess technological target areass, as well as to establish the capability and performance of designated centres. Regional and local authorities should be kept fully informed of the results of these evaluations;

(b) Equipment, including intangible investment such as the purchase of patents and, where it cannot be financed from the resources provided for in the operational programmes submitted under the CSFs on the initiative of the Member States, basic infrastructure relating to:

- Science and technology parks (limited to R&TD facilities),
- The creation and development of R&TD centres, industrial research associations, contract research organisations, and other institutes, including the transformation, renovation, and upgrading of existing facilities,
- The creation an improvement of laboratories which are an integral part of technical education and scientific establishments, or which take part in research projects or technology transfer activities, particularly in association with firms in the region, or the creation and improvement of laboratories for research purposes in small- and medium-sized enterprises;

(c) The financing, for the duration of a specified research project, of the extra operating expenditure incurred as a result of transferring R&TD activities and research staff from prosperous regions or of nationals abroad returning to an objective 1 region. The dispositions governing the granting of this aid must be agreed in advance with the Commission of the European Communities.

Category B

Promoting Participation and Greater Interconnection in Community and Other International Research Programmes and Networks

7. Under this category of measures, and in addition to the measures described under category A above, STRIDE may finance:

(a) Actions to disseminate information among research centres including universities and firms about Community-assisted and other research programmes and networks. Priority should be given to using existing structures;

(b) Support to preparatory work for taking part in international cooperation for research, by assisting research centres, universities and businesses in technical preparation necessary for drawing up proposals and by financing equipment they need to gain access to networks;

(c) Demonstration and pilot activities concerning technological applications made possible by Community-assisted and other research programmes, provided that they are of significance for the regional economy in question;

(d) The development of twinning arrangements with research institutes located outside objective 1 regions, which can facilitate staff exchanges, access to research equipment or joint research activity; the actions must take account of assistance granted under the Science programme.

Category C

Promoting Linkages Between Research Centres and Industry

8. In objective 1 and, to a more limited extent, in objective 2 regions, STRIDE may assist the promotion of innovation by encouraging and reinforcing R&TD activities in firms, building on the experience of the actions and networks funded by the SPRINT, VALUE and COMETT programmes wherever possible so as to bring together the different participants at a regional level as well as at an international level.

9. To encourage linkages for R&TD purposes between firms and among firms and research centres, STRIDE may finance the following measures:

(a) The setting up and operation of consortia and other bodies which foster cooperative links among education and research bodies and between them and entreprises. In some instances, the role of the regional university-business training associations set up under the Comett programme might be expanded to include these activities;

(b) In objective 1 regions only, establishing or supporting aid schemes for firms in the following fields where expenditure results from a joint research project carried out by more than one firm or by a firm and a research centre or other qualified centre:

- Assistance for the purchase of equipment and know-how for applied research, experimental development, pilot projects and the introduction of innovation into products and processes, and research related to quality control,

- Approved research projects undertaken by small- and medium-sized enterprises,
- Expert studies for the technical and financial evaluation of plans in research, or the promotion of innovation, in addition to measures supported by the VALUE programme;

(c) In objective 1 regions only the creation and in objective 1 and 2 regions the development of technology transfer and innovation services and facilities intended to serve regional development, provided that such actions are run in partnership with the productive sector, and that the need for actions supplementary to those already existing can be demonstrated, including:

- equipment for research,
- the operating costs of teams, belonging to either R&TD centres, industrial research associations and institutes or technology transfer agencies, responsible for assisting technology transfer to enterprises,
- promotion work aimed at regional and local economic operators, including information campaigns,

(d) the extension of inter-regional cooperation networks set up by the Community, in particular for innovation (Sprint), by financing facilities that cannot be funded under other Community programmes;

(e) vocational training requested by the productive sector including that undertaken by the organizations referred to under paragraphs 9(a) and (c) for appropriate personnel such as technicians, engineers, researchers and experts including the updating of training after an initial professional experience; for the application of innovations including training for middle and senior management of SMEs; for the management of R&TD and for technology transfer agents;

(f) the short term detachment for training purposes of personnel from research centres or firms located in eligible regions to research centres, firms or agencies providing services related to technology transfer or innovation in other regions of the Community or in third countries. Such measures would have to be essential to the development objectives of STRIDE and must take account of assistance granted under programmes such as comett.

III. The Community's Contribution to the Financing of STRIDE

10. The STRIDE programmes shall be the subject of joint financing by the Member State and the Community. In areas eligible for STRIDE, the total contribution by the ERDF [European Regional Development Fund] and ESF [European Social Fund] during the period 1990 to 1993 is estimated at ECU 400 million. Loans from EIB [European Investment Bank] and ECSC [European Coal and Steel Community] resources may also be made available. On the basis of this initial experience, the Commission will examine at the appropriate time a possible prolongation of measures financed under STRIDE in areas eligible for assistance from the Community's structural instruments.

11. The amount of the Community's budget contribution to individual operational programmes will take into account regional differences in the distribution of R&TD activities and the quality of the operational programme. The rates of assistance will be decided in conformity with the provisions of the regulations governing the structural funds and take account of the financing capacity of the national and regional authorities concerned. In evaluating the quality of the programme, the Commission will take into account the following elements, in particular:

- The presence of a coherent R&TD strategy with a clear statement of the aims for regional technology development into which the aims of the operational programmes under STRIDE have been properly integrated,
- The likely development impact of the proposed measures and in particular their contribution to the achievement of the aims of the operational programme, their coherence with other Community actions and their likely impact on the productive sectors of the regional economy,
- A demonstration of the additional character of the resources requested from the Community as well as those made available by the national and regional authorities and private sources in support of the operational programme;
- The ability to integrate with and make use of existing and planned networks within the European Community,
- Effective mechanisms for implementation, management, monitoring and evaluation.

IV. The Management of Operational Programmes

12. The design and management of programmes submitted under STRIDE should reflect informed scientific opinion on the R&TD and technological potential of the regions concerned.

In the preparation stage, the Commission will offer the necessary technical assistance to ensure that the priorities to be proposed in the programme reflect a rigorous scientific and economic evaluation. At the implementation stage, the monitoring of programmes should also involve recourse to scientific opinion on the choice of individual projects and progressing of them, according to dispositions to be jointly agreed between the Commission and the Member State concerned. These dispositions must include safeguards, to avoid any risk of double financing by the Community.

During the third year of implementation an evaluation of the results of STRIDE will be made, highlighting its contribution to greater economic and social cohesion.

13. Where appropriate, funding may be disbursed through a global grant to one or several intermediaries with the necessary scientific and financial expertise designated for that purpose by the responsible authorities of each Member State in agreement with the European Community.

V. Implementation

14. Member States wishing to benefit from STRIDE are invited to present detailed proposals for operational programmes, or amendments to an existing or proposed operational programme in application of Community Support Frameworks, within six months of the date of publication of this notice. Proposals for operational programmes received after this date need not be taken into consideration by the Commission.

15. Expenditure related to objective 1 and objective 2 areas should be separately shown, where relevant. Requirements for technical assistance for the implementation of operational programmes should also be separately identified.

16. All correspondance related to this notice should be addressed to:

Mr. E. Landaburu, Director-General, Directorate-General for Regional Policy, Commission of the European Communities, 200, rue de la Loi, B-1049 Brussels.

EC Policy on Third-Country Cooperation

90AN0338 Brussels EUROPE in English 14 Jun 90 pp 9-10

[Report: "Research/European Commission: Communications to the Council Concerning Scientific and Technological Cooperation With Third Countries in General and Eastern Countries in Particular"]

[Text] Strasbourg, 13 June (EU)—The European Community's cooperation with third countries in the area of science and technology is part of the general ideas expressed in the third Framework Programme for research, and its implementation, with a view to the single market, will require the definition of a Community policy. This policy will necessarily go beyond the various cooperation formulae already experimented and implemented in past years, and its definition requires a thorough political debate within the Council and the European Parliament (EP). Answering a request made by the Research Council in June 1989, the European Commission, upon a proposal of Mr. Pandolfi [EC Commission vice president], has just approved today a communication to the Council concerning scientific and technological cooperation with third countries accompanied—given the political developments of the last few months—by a specific communication to the Council and to the EP aimed more particularly at scientific and technological cooperation with the countries from Central and Eastern Europe.

1. Scientific and Technological Cooperation With Third Countries

Generally speaking, the growing globalisation of the world economy, coupled with the rapid development of sciences and technologies and their increasing interdependence and multi-disciplinary nature, as well as their increasing importance for industry and general well-being, require a Community policy to deal with cooperation in this field. The Commission recalls first of all the various forms of cooperation experimented in past years with industrialised countries (EFTA countries, United States, Japan, Canada, Australia and New Zealand), newly industrialised countries, Mediterranean countries and developing countries. Next to these bilateral cooperation arrangements, multinational actions such as COST [Cooperation in Scientific and Technical Research] and EUREKA should be mentioned, as well as specific agreements such as those concerning the international thermonuclear experimental reactor (ITER) which brings together the EEC, the United States, Japan and the USSR, the Intelligent Manufacturing System (IMS) initiated by Japan, and the Superconducting Supercollider (SSC), which provides an interesting example of collaboration between the EEC, CERN [European Center for Nuclear Research] and the United States.

From now on, and with a view to 1993, the process of European integration requires the Community to play a more active role in the development of international scientific and technological cooperation. To that end, the Commission highlighted the main principles and guidelines for a Community policy, namely:

a. Horizontal principles determining the objectives of cooperation in the area of science and technology as a necessary extension of the EEC's international policies. They are the following:

- Support of initiatives of global nature, such as the environment, the greenhouse effect, other possibilities of climatic changes, epidemics and malnutrition;
- Support for the international scientific community, a theme selected in the third Framework Programme under the heading "Human Resources and Mobility", and which is concretely implemented notably through an exchange programme for researchers, which may be extended to third countries. Interest in this initiative has already been manifested by EFTA countries and the United States notably;
- Selective cooperation activities in the area of S&T, as a useful contribution to industrial and economic development at world level. In this respect, and taking account of the direct or indirect impact of technological development on international competition, the identification of concrete cooperation possibilities

must meet selective criteria, notably the action of market forces and mutual access to the possibilities offered by the market.

b. Vertical principles concerning the geographical characteristics and situations of third countries:

As concerns neighbouring countries of the EEC, the preamble of the Framework Programme should be applied and the intensity of the possible initiatives will depend upon the degree of implementation of the European Economic Space; particular attention will be paid to the interests of developing countries, and the Community's effort in that area will in no way be reduced because of the contemplated aid in favour of countries from Central and Eastern Europe, dealt with in the second communication.

2. Scientific and Technological Cooperation With Countries From Central and Eastern Europe

The Commission considers that it would be a serious mistake to see cooperation with the Eastern countries as a simple extension of the various types of S&T cooperation established or contemplated with third countries in general. The new cooperation presents specific aspects, since it will have to take account of the particular situation of these countries which had state-run economies in the past that will have to be transformed into market economies.

S&T cooperation will take three forms, namely:

a. Scientific cooperation strictly speaking, a domain in which not only the third countries concerned but also the Community will have advantages, these countries in question having a long diversified tradition in different scientific fields. In the field of mathematics, for example, Hungary ranks high, in particular, for applied mathematics, statistics and probability. In the field of physical sciences, Poland has remarkable experience in acoustics, applied physics, atomic and molecular physics and chemistry, optics, spectroscopy and physics of particles and fields. Czechoslovakia has strong points particularly in astronomy, astrophysics, crystallography, geoscience and in the field of condensed matter, etc. In all these domains, European research will gain a vast reservoir of human capital, often unemployed up till now.

b. Research and development—activities encouraging technology transfer: There is a need to close the technological gap between industries in Central and Eastern Europe as compared with that of Western Europe, to meet the problems raised by the high intensity of raw materials and the considerable industrial consumption of energy in Eastern Europe (energy saving, environmental protection) as well as the inability of these countries to meet requirements in consumer goods. A great effort is both necessary and urgent in the technology transfer field.

c. Cooperation in the field of human resources: Under this title, the Commission includes in particular the extension to East European countries of the programme on the freedom of movement of researchers provided for in the third Framework Programme.

From a practical point of view, the cooperation should be achieved through: coordinated assistance from the "Group of 24"; financial assistance through the European Investment Bank (EIB), the World Bank and also the recently created European Bank for Reconstruction and Development; the participation in certain COST actions as well as the participation in Community programmes, in some cases with financial assistance from the Community.

East and Central European countries included in the communication group are Bulgaria, Czechoslovakia, Hungary, Poland, Romania and Yugoslavia; those excluded are the GDR (eligible for assistance from the Group of 24 but which should soon be an integral member of the EEC) and the USSR for which cooperation comes under the cooperation agreement in application since 1 April 1990.

EC Approves Dutch S&T Assistance Plan

90AN0356 Brussels EUROPE in English 6 Jul 90 p 12

[Report: "State Aid/Netherlands/Technology: European Commission Approves the 1990 Refinancing of the Dutch Scheme 'Programmatische Bedrijfsgerichte Technologiestimulering (Business-Oriented Technology Stimulation Scheme)'"]

[Text] Brussels, 5 July (EU)—The EC Commission decided to approve the implementation for the year 1990 of a Dutch aid scheme, the Business-Oriented Technology Stimulation Scheme (PBTS), covering feasibility studies, basic industrial research, and demonstration projects in four areas, namely: information technology, material technology, biotechnology, and environmental technology.

The budget for the current year amounts to HFl 127 million (about ECU 54 million) and the aid is allowed under the form of an outright grant. The maximum aid is limited to HFL 250,000 for feasibility studies and to HFL 500,000 for demonstration projects. While 20 percent of the total budget is reserved for each of the four subprogrammes, if firms decide to get together temporarily for a research project the maximum aid amount for feasibility studies and for demonstration projects is doubled. Grants can cover up to 37.5 percent of the eligible project costs and cumulation with other aids is possible up to 50 percent for undertakings with more than 250 employees and to 60 percent for firms with 250 workers or less, although this is limited to feasibility studies and research projects.

FRG Research Ministry Presents 1991 Budget

90MI0301 Bonn WISSENSCHAFT, WIRTSCHAFT, POLITIK in German 11 Jul 90 p 4

[Text] Presenting the 1991 fiscal year budget for research, Minister Heinz Riesenhuber said, referring to the somewhat modest increase of four percent over the previous year: "This is a very, very tight budget." The overall federal budget shows a rise of 3.9 percent. The BMFT [Federal Ministry of Research and Technology] budget thus shows expenditure amounting to approximately 8.2 billion Deutsche marks [DM]. Of the individual headings, space travel has the largest slice of the cake. Taken together with the Atmos environmental research satellite and hypersonic research, this field accounts for around DM1.5 billion, 20 percent of the total budget. As regards the key technologies, computer science (including manufacturing technology), with around DM856 million in subsidy funds, still leads the field ahead of nuclear energy research (including reactor safety with DM624 million. However, if nuclear fusion expenditure of around DM203 million is included, the two fields receive almost the same amount of funds. Climate research will encompass a wide range in 1991 with DM538 million. "Since 1982 the BMFT has progressively increased and extended climate research," said Dr. Riesenhuber.

According to the federal research minister, the development of environment-compatible energy supplies will play a key role in overcoming global and regional environmental risks. The federal government's third energy research program, which had recently received federal cabinet approval, devoted special attention to this aspect. BMFT statistics place the Federal Republic ahead of the rest of the world in promoting renewable energy resources and more efficient use of energy. Approximately some DM306 million are earmarked for this purpose in 1991. The emphasis lies with basic research and development and with testing complete energy supply systems. This includes, for example, the detailed testing of 1,000 small grid-linked photovoltaic systems (the "1,000 roof" program) and the 200 megawatt wind power program.

The Federal Minister of Research made it quite clear: "The federal government still regards nuclear energy as an important part of the national and international energy supply." Research work on safety and disposal will be undertaken in this area. The BMFT estimates that subsidies for nuclear energy projects will fall from their 1982 level of DM1.4 billion to DM318 million in 1991, because the major reactor development lines will have been completed. Dr. Riesenhuber concluded: "Further nuclear engineering developments are now up to industry." In order to achieve a significant reduction in the carbon dioxide emissions resulting from energy production, the BMFT has launched a research project to establish the prerequisites for a CO_2 reduction strategy.

FRG Research Society Funds New R&D Projects

90MI0281 Bonn WISSENSCHAFT, WIRTSCHAFT, POLITIK in German 20 Jun 90 p 6

[Text] Three new special research programs will be set up at German universities by 1 July 1990. This was decided by the authorizing committee of the German Research Association (DFG) in early June. The DFG will thus be subsidizing 170 special research programs at 46 universities for a total of 362 million Deutsche marks [DM] in 1990.

"High-Temperature Problems with Retrievable Space Transport Systems" are the subject of a new special research program at the University of Stuttgart, in which the German Aerospace Research Institute (DLR) is also participating. This constitutes the fourth special research program on the principles of hypersonic flight, following those at the Universities of Aachen, Munich, and Braunschweig. It will focus on materials research, and it is of great general importance for the solution of high-temperature problems. In hypersonic flight these problems arise through extremely high temperatures (up to 1,800° C) occurring both during the spacecraft's reentry into the atmosphere and in the engines during the ascent phase. The characteristics and deterioration mechanisms of the materials under these temperatures are still largely unknown. The work schedules of the four special research projects at the various universities are coordinated in this respect.

Under another special research program at the University of Stuttgart, engineering scientists and physicists have taken "Highly Dynamic Beam-Control and Beam-Forming Devices for Three-Dimensional Processing with Beams" as their subject. Laser beams are currently used to weld, heat, and harden an extremely wide range of materials. Fast, high-precision beam control and forming contribute significantly to efficient exploitation of the laser system. The problems relating to the arrangement of deviation mirrors for beam control will be a key aspect of this research because the laser source is often a considerable distance from the workpiece to be processed. In fact it will not be possible to transmit the beam generated by a CO_2 laser in the required power range via flexible fibers in the foreseeable future. Solid-state lasers, whose beam can be transmitted via cable, are not available in the high power range required. The new special research program at the University of Karlsruhe proposes to work on "Components for Computer-Integrated Component Design and Manufacture." Information-processing systems designed to ensure competitiveness will play an increasingly important role in the "factory of the future." This special research program will develop new computer-aided processes with close cooperation between computer science and mechanical engineering.

FRG: Nuclear Research Center Expands Cooperation With GDR

90MI0243 Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN in German 28 May 90 pp 13-14

[Text] The Karlsruhe Nuclear Research Center (KfK) has intensified and greatly expanded its relations with GDR scientific institutes and universities in the past few months. In addition to its cooperation with the Central Institute for Nuclear Research (ZfK) in Rossenforf near Dresden and the Dresden Technical University in the field of reactor safety as part of a government agreement concluded two years ago, the KfK is also cooperating in the fields of environmental and materials research as well as in the production of radioactive pharmaceuticals. Joint technology transfer projects are planned. The KfK's most important GDR partners, in addition to the ZfK, which is part of the GDR Academy of Sciences, and the Central Institute for Solid-State Physics and Materials Research in Dresden, are the Martin Luther University at Halle-Wittenberg, the Dresden Technical University, and the Zittau Technical College.

The "Bruno Leuschner" nuclear power plant in Greifswald has also demonstrated an interest in cooperating in the field of safety with the GDR Academy of Sciences and the Dresden and Zittau universities, which study fuel element and fission product reaction in serious accidents in pressurized water reactors. The GDR would like to carry out its own experiments in three different experimental stations in Karlsruhe and would like the nuclear research center to contribute to the construction of a model containment shell near Leipzig and to use its experience in a corresponding experimental program. Training courses for the Greifswald staff have also been planned at the KfK school for nuclear technology.

The removal of nitrate from drinking water is the subject of an agreement with the Martin Luther University, while high-temperature superconductivity is the subject of a cooperation agreement with the ZfW. The cooperation sought after in the field of technology transfer began in early April with the participation of several employees of the Suhl State Date Processing Center in a basic seminar on CAD [computer- aided design] at the KfK's CAD-CAM [computer-aided manufacturing] laboratory in the Karlsruhe technology factory. The exchange of trainee instructors and the use of the KfK's experience are also envisaged for the establishment of new organizational and administrative structures at the Rossendorf-based ZfK, where the KfK will also provide assistance. Meanwhile, a considerable list of equipment requested by many GDR research institutes has been presented.

During the next few weeks the first visiting scientists from the GDR are expected to arrive at the nuclear research center for study visits of several months to a year. These, and other personal contacts at various levels should soon lead to the identification of additional joint research activities. Consequently, on a medium-term basis, an even wider cooperation between the KfK and GDR research institutes may be anticipated.

FRG: Volkswagen Subsidizes GDR R&D

90MI0320 Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN in German 27 Jul 90 pp 9-10

[Text] Once again the Volkswagen Foundation has made available funds for the improvement of facilities at the universities and technical institutes of the GDR. Under a special program for which the supervisory board has appropriated 5 million Deutsche marks [DM], the universities of Berlin, Greifswald, Halle-Wittenberg, Jena, Leipzig, and Rostock, as well as the Freiberg Mining Academy, are to receive a total of 700 PC's including periphery and software. In March of this year the Volkswagen Foundation made available to these institutions DM10 million for the procurement of specialized literature and copying equipment. The books and the equipment will be available for the coming winter semester, if possible.

In March 1989 the Volkswagen Foundation offered to support scientific cooperation at institutes of higher learning and at research institutes in both Germanies on an even larger scale. This offer was at first not tied to disciplines or projects on which the foundation usually concentrates. Following the opening of the borders the demand increased dramatically. By mid-1990 the Volkswagen Foundation had received more than 200 applications totaling over DM60 million.

In mid-March 1990 the number of requests for funding, together with the gratifying fact that the German Research Association and other institutions had in the meantime started subsidizing cooperation with science in the GDR, caused the Volkswagen Foundation to conclude the program as originally conceived. All applications received by that deadline will, however, be reviewed and evaluated. What continues to be possible is the funding of joint projects within the framework of the foundation's relevant key objectives.

FRG: BMFT Subsidizes GDR Technology Centers

90MI0322 Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN in German 27 Jul 90 pp 10-11

[FRG Ministry of Research and Technology announcement of subsidies for the establishment and expansion of technology centers in the GDR and East Berlin, dated 25 June 1990]

[Text]

1. Purpose of Subsidies

Under the funding program entitled "Establishment and Expansion of Technology Centers in the GDR and East

Berlin," subsidies will be given to cities, local authorities, research and training establishments, chambers of commerce, and other bodies in the GDR and East Berlin that intend to establish technology centers in cooperation with technology centers and other organizations in the FRG, including West Berlin. A prerequisite is that adequate plans be available and that the cost of the intended establishment or expansion be incurred mainly in 1990.

Additional, related measures for the support of new technological businesses that settle in these centers or in the areas served by them will be announced subsequently.

2. Items Eligible for Subsidies

2.1 The procurement of goods or the awarding to third parties of contracts required to set up a functional, and in particular technical and communicative infrastructure in these technology centers in the GDR and East Berlin, provided they purchase the goods from their cooperation partners in the FRG including West Berlin or the latter award the contracts concerned to third parties in the FRG including West Berlin.

2.2 The work of persons from the FRG including West Berlin who take up management positions in these technology centers and provide technical and commercial advice for young technological companies.

2.3 The technology centers must submit plans demonstrating that they are able to: provide suitable premises for young technological businesses; properly advise young technological businesses; mediate among research and training establishments, businesses, donor, and finance institutes via contact networks, and provide assistance in obtaining permits, purchasing materials, organizing exports, and the like.

2.4 The technology centers must show that they will be supported by the GDR or the local authority under which they are to be established.

3. Eligibility for Subsidies

3.1 Those eligible to apply for subsidies under

- Number 2.1 are the technology center and other organizations in the FRG and West Berlin that cooperate with the technology centers in the GDR and East Berlin.
- Number 2.2 are the technology centers and other organizations in the FRG and West Berlin that second personnel to the technology centers in the GDR or East Berlin.

3.3 The "other organizations" must prove that they have acquired sufficient experience in establishing and running technology centers in the FRG including West Berlin.

4. Conditions for Subsidies

4.1 Applications for subsidies under number 2.1 and 2.2 must be supported by fully negotiated draft cooperation agreements or extensions to existing cooperation agreements and evidence of support from the GDR or the local authority under which the technology center is to be established. The cooperation agreements must lay down the major procedures and the reciprocal rights and duties of the partners, e.g.:

- Form of cooperation
- overall financing of the technology center
- managerial responsibility for the technology center.

4.2 In the event of subsidies granted according to:

- Number 2.1 the goods to be procured and the contracts to be awarded must be set out in a separate list and attached as an appendix to the cooperation agreement;
- number 2.2 the eligibility of the persons to be seconded must be demonstrated as regards their competence in innovation management, their ability to manage the center, and their capacity to advise young technological businesses. The draft secondment agreement must be attached to the application.

4.3 Service deriving from contractual agreements that were legally concluded before the date of application are not eligible for subsidies. The decisive date is that on which the application is submitted to the VDI/VDE [Association of FRG Engineers/Association of FRG Electrical Engineers] Computer Engineering Technology Center (see number 7.4).

4.4 The terms of the contractual agreements must comply with the collateral clauses governing BMFT [Federal Ministry of Research and Technology] subsidies (see number 6.1). The contractual agreements must be legally concluded by the time the subsidy is paid at the very latest.

5. Type and Extent, Amount of Subsidy

5.1 Up to 75 percent of expenses eligible for subsidies may be granted, up to a total maximum of 1.5 million Deutsche marks per technology center in the GDR including East Berlin for subsidies under numbers 2.1 and 2.2.

5.2 The following are also eligible for subsidies:

- Under number 2.1 expenses for goods procured, including incidental expenses (transport, insurance, etc.), and contracts awarded to third parties, provided these are technology centers or other organizations in the FRG including West Berlin;
- Under number 2.2 the costs incurred for the personnel seconded to the technology centers in the GDR or East Berlin, including travel time, must be documented by means of timesheets.

6. Further Conditions for Subsidies

6.1 The project funding principles laid down by the BMFT in the General Collateral Clauses Governing Expenditure-Based Project Funding apply to these subsidies. 6.2 The professional duties set out in section 5b of the said General Collateral Clauses are amended as follows:

Interim reports are to be submitted annually, no later than four months after the end of each year. The interim reports and the final report will use publications by the technology center in the GDR or East Berlin and contain detailed information on the following aspects:

- Progress made in the joint project;
- Commercial development of the technology center and the region served by the technology center;
- number of businesses in the technology center and the region served by the technology center;
- development of the businesses (failures, etc.).

7. Procedure

7.1 Applications for subsidies for projects under this development program should be submitted on the prescribed forms to the VDI/VDE Computer Engineering Technology Center GmbH, Budapester Str. 40, 1000 Berlin 30. Application forms may be obtained from the same address.

7.2 The Federal Minister of Research and Technology will decide whether a subsidy will be granted.

7.3 The notification of grant will state the period for which the subsidy is approved. Costs incurred in connection with the project will only be subsidized if they fell within the approved period.

7.4 The Federal Minister of Research and Technology has appointed the VDI/VDE Computer Engineering Technology Center GmbH to administer the subsidy program as project manager.

The project manager is responsible in particular for providing information about the subsidy program, examining the applications and the firm's handling of the subsidies. The project manager is bound by the rules of confidentiality.

Bonn, 25 June 1990

The Federal Minister of Research and Technology

by order

Bachelier

Italian Participation in EUREKA Projects Reported

90MI0257 Turin MEDIA DUEMILA in Italian May 90 pp 42-45

[Article by Massimo Bozzo: "EUREKA, An Italian Success"]

[Text] During Italy's year as president of the EC's EUREKA [European Research Coordination Agency] research initiative, the approval of new projects has speeded up thanks to the Italian proposal to examine applications on a quarterly rather than on a yearly basis. Last 14 February, new research projects were approved by the representatives of the countries involved in the program, which include 19 European countries (the 12 EEC countries, the six EFTA [European Free Trade Association] members, and Turkey) as well as the EC Commission.

When Italy took the chair at the interministerial conference in Vienna, 297 research projects were awaiting implementation, involving a total investment of 9.6 trillion lire. An additional 89 new projects with a total investment of 2.4 trillion lire had been approved at Vienna, 30 of which involved Italian companies and research institutes, while 21 involved the environment, 21 robotics and automated manufacturing, 15 computer science, and 14 biotechnology.

Italy is taking part in 87 projects, with a total investment of over 2 trillion lire. It is involved in six of the 14 most recently approved projects: Three deal with robotics and three with the environment. The funding amounts to more than 21 billion lire, that is, 27 percent of the approximately 80 billion lire total cost. Of these 14 projects, which have an overall cost of approximately 120 billion lire, five have to do with robotics, five with the environment, two with computer science, and two with biology. Italy is taking part in a robotics project on the control of composite materials production and in two projects on the applications of robotics in space with the participation of Aeritalia. The environmental projects that involve Italy deal with new substances for the preservation of granite monuments (Central Institute for Restoration), the construction of a TV camera for submarine inspection, and the development of sensors to monitor air, soil, and water pollution as well as acid rain and fog (Officine Galileo, Tei, Fisia).

Another 10 environmental projects are in the process of being approved under ENVINET, a program for the development of an electronic environmental control system. Other initiatives include a directory of the European companies, research institutes, and universities (a total of 1,600) participating in the 297 EUREKA projects. Italy's presidency will expire at the end of May, with an exhibition on European research activities to be held in Rome. The feasibility study for the establishment of a European environmental school at the EEC's research center in Ispra—a project that has already been allocated eight billion lire by the Varese provincial council—will be completed by the end of June.

One of the major projects approved in Vienna is the JESSI [Joint European Submicron Silicon Initiative] microelectronics project, which has passed from the project stage to the development stage. The project will be allocated 6 trillion lire over the next eight years, 800 billion of which will be allocated for the initial phase

alone. JESSI is the most ambitious industrial development program of the coming decade, and will enable the European semiconductor industry to compete with the Japanese and American industries. The JESSI project involves a 15 percent participation by Italy amounting to approximately 800 billion lire and a significant participation by the Italian-French company SGS-Thomson.

Italy's presidency also coincided with the beginning of the 1989-92 medium-term plan. This plan identifies the specific areas where future research should be concentrated in the sectors of communication networks, railway transport, and environmental protection. Among the issues calling for immediate action, the plan emphasizes the need to develop a concerted strategy to encourage and ensure worldwide acceptance of the European HDTV standard for high definition television. The EC Commission will play a coordinating role in the experimental development of the European standard.

These are the principal features of the projects, which have been subdivided by topic:

1. **Environment.** There are 32 EUREKA projects in this area, with an estimated total cost of 990 billion lire, and 340 participants, including 100 companies and more than 200 research institutes and universities. Under Italy's presidency, top priority has been given to this area.

2. **Lasers.** In this sector, Italy has been involved in Eurolaser's "umbrella project" from the very start of the EUREKA initiative in 1985. Italian companies and agencies in this sector have contributed to its definition phase through the development of three EUREKA projects in which Italy's contribution was predominant, and through a significant participation in two other projects that are primarily foreign. The official request for funding for a project to develop power laser equipment, to be carried out by three Italian companies and by ENEA [Italian Committee for Research and Development of Nuclear and Alternative Energies] in cooperation with three German operators, is nearly completed.

3. **Robotics.** Robotics and factory automation are among the most important areas of the EUREKA initiative. In fact, robotics attracted the highest number of proposals for projects (23 percent of the total). Italy is involved in 29 (34 percent of all the projects featuring Italian participation). In terms of investments, the robotics and automation area comes third after computer science and telecommunications, with investments amounting to 1.417 trillion lire (18 percent of total investments in the EUREKA program). Italy's share amounts to approximately 997.5 billion, accounting for 20 percent of all the EUREKA projects featuring Italian participation).

4. **Transport.** With 18 projects underway, the transport area accounts for approximately six percent of all EUREKA projects, with a total cost of approximately 840 billion lire. A large number of the projects deal with road traffic and transport. Italy is involved in five projects, that is, 5.75 percent of all the projects carried out with Italian involvement, with a financial commitment of approximately 127 billion lire. Italy is taking part in two air transport projects: Eurofar, for a short- and medium- range convertiplane (Italian costs, 17.5 billion lire), and an advanced amphibian fire fighting and surveillance aircraft (six billion lire).

5. **Biotechnology.** There are 55 projects currently underway, valued at over 750 billion lire. Italy is involved in nine projects, accounting for 9.37 percent of all projects with Italian participation.

6. **New Materials.** There are 23 projects, representing eight percent of the total of 297. The total cost is approximately 230 billion lire. Italy is involved in four projects, with funding amounting to 13.5 billion lire.

7. **Telecommunications and Microelectronics.** This area comprises four distinct fields: Audiovisual technologies, advanced optical technologies, telematic networks for various applications, and microelectronics (JESSI project).

Italy's Leadership of Eureka Evaluated

90MI0310 Turin MEDIA DUEMILA in Italian Jul-Aug 90 pp 52-57

[Text] The EUREKA [European Research Coordination Agency] research initiative, which includes 19 countries and the European Commission, saw its number of projects increase from 294 to 385 during its "Italian year." This record growth of almost one-third (31 percent to be precise) has brought its overall funding to ECU 7.721 billion (almost 11.6 trillion lire).

Italy's year as the president of EUREKA—from the Vienna conference in June 1989 to the Rome conference in June 1990,—helped give a strong impulse to its own participation in the technological cooperation program: For example 40, almost half, of the 91 projects announced in Rome, involve Italian companies or research centers. Italy's financial investment even accounts for 35.3 percent of the total value of the new projects (ECU 340 million out of ECU 964 million or approximately 510 billion lire out of almost 1.450 trillion lire).

This jump forward in participation during the last year places Italy second in EUREKA for capital invested and third for involvement in projects: France is first in both categories and is followed by the FRG in the latter (France and the FRG were the promoters of the initiative). Italian investments amount to a total of ECU 1.232 billion (about 1.850 trillion lire) out of ECU 7.721 billion and involve 130 projects out of 385.

The 91 new projects, involving a total investment of ECU 964 million, are divided into the following research sectors: 37 deal with the environment (22 with Italian participation), 22 robotics and automation (10 Italian), nine each biotechnology and computer science (four

Italian), five materials (three Italian), four transportation (one Italian,) three telecommunications, and two energy. No project was launched in the laser sector.

Prior to the conference in Rome, statistics based on investments of ECU 6.517 billion (more than 9.750 trillion lire), indicated that the EUREKA projects were divided into the following research sectors (the investment per sector and the number of projects per sector with Italian participation are provided in parentheses): robotics and automation 67 (ECU 1.115 billion, 28), biotechnology and medical research 55 (ECU 542 million, 10), computer science 50 (ECU 1.512 billion, eight), the environment 32 (ECU 607 million, 13), materials 24 (ECU 159 million, four), transportation 21 (ECU 591 million, five), communications 19 (ECU 1.194 billion, nine), energy 14 (ECU 526 million, two), and lasers 13 (ECU 271 million, eight). These statistics do not include those projects that were launched and later abandoned (or combined with other research).

The number of projects launched at the conferences preceding the Rome conference were as follows: seven at Hanover in 1985; 57 at London in 1986 and 35 at Stockholm that same year; then for the following years, 55 at Madrid, 54 at Copenhagen, and 89 at Vienna. Rome, therefore, brought in a record number of new projects. The countries participating in projects on the eve of the Rome conference were the following: France 135, Germany 108, Italy and the UK 87, Spain 85, the Netherlands 73, Sweden 50, Austria 39, Belgium, Denmark, and Switzerland 36, Norway 34, Finland 30, Portugal 21, Greece 15, Ireland 9, Luxembourg 5, Iceland and Turkey 3, as well as four projects involving the European Commission.

The upsurge in Italian participation was highlighted by Italian Research Minister, Antonio Ruberti, who drew a balance of Italy's presidency when closing the ministerial conference. Ruberti, several extracts of whose speech we publish below, expressed his great satisfaction with the results obtained which "open up new prospects for technological research" in our country. The vice president of the European Commission and research director, Filippo Maria Pandolfi, reconfirmed EEC support for EUREKA and identified four levels of support: the organic link between EEC and EUREKA research programs for the 1990-94 research program established by the Council of Ministers of the twelve member countries; a growing participation in single projects; support for related activities; political support in the various international organizations dealing with standards and regulations.

The Rome conference, at the end of which the presidency of EUREKA passed over to the Netherlands Minister of the Economy, outlined the direction of the program for the immediate futures:

a) A strong increase in technological research in the field of environmental protection (37 of the 91 projects inaugurated at Rome deal with this sector which thus becomes EUREKA's second most important technological area);

b) an opening toward Central and East European countries with whom EUREKA intends to promote cooperation from the moment projects are launched. These tendencies, which emerge both from the final communique of the ministerial conference and an analysis of the projects now under way, are proof of EUREKA's capacity to adjust to the political, economic, and social changes in Europe and to find appropriate, adaptable responses. The program, born as a peaceful, constructive, European response to President Reagan's American strategic research initiative, the "Star Wars" program, has progressively adapted to the reality of a Europe without borders and with common concerns on the environmental front.

When announcing its own program, the Netherlands presidency gave a preview of its intention to establish a committee to evaluate the projects being carried out. The committee will be directed by the ex-president of Philips and leader of European businessmen, Wisse Dekker. In addition, the "club" of parliamentarians dealing with scientific and technological development matters established during the Italian presidency will remain. At a meeting held in Montecitorio in mid-May, the representatives from the countries participating in EUREKA expressed their general satisfaction with the progress of the European program. "EUREKA" said Antonio La Pergola, a member of the European Parliament and, president of the Strasbourg Assembly's energy, research, and technology commission, "is an example of how to overcome the sclerosis of community programs and conceive new forms of cooperation in a world where the new political and economic order is characterized by opening relations with the East bloc and by the demand, even technological, of developing countries." EUREKA already has nine projects with East European participation and another nine with Latin American partners.

SUPERCONDUCTIVITY

FRG: Dornier Develops Superconducting Elements for DESY

90MI0224 Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN in German 27 Jul 90 pp 17-18

[Text] Dornier GmbH, a company of the German Aerospace Group, is currently supplying the German Electron Synchrotron (DESY)in Hamburg with the last units of superconductive acceleration elements structures for HERA, the new hadron storage ring installation. This 6 million Deutsche mark [DM] order which Dornier received in December 1987, involves the first industrial serial production of 16 superconductive niobium resonators including the required eight helium containers.

The German research center DESY makes available to international research large accelerator installations for high energy physics. The biggest installation in Hamburg is the proton-electron ring accelerator HERA with a 6.4 kilometer-long tunnel. DESY and the CERN [Nuclear Research Center] Institute operating in Geneva represent the two most important European research institutes for nuclear basic research.

The most essential discoveries of the past few years, in which DESY was closely involved, are the so-called "quarks," the smallest structural components of the nuclear particles proton and neutron, as well as the interacting forces between the nuclear components, the so- called gluons and vector bosons.

Since the exploration of increasingly smaller basic components of matter requires increasingly stronger "disaggregating energy," the accelerator installations likewise must become bigger and thus more powerful.

HERA is the first storage-ring complex in which two charged component of matter—protons and electrons—are hurled against each other for the purpose of studying the proton structure and its components with a hitherto unattainable disintegration. To this end, the protons are accelerated to an energy of 830 GeV (giga electron volts) and hurled at their about 2,000 times lighter partners, the electrons, which themselves are accelerated to 30 GeV.

The energy transfer required for the acceleration of the electrons is taking place in the acceleration resonators (cavities) which to date had been made of copper. The disadvantage of copper, however, is that its electric resistance causes the loss of a great amount of energy in the form of heat. Energy losses are much smaller if superconductive materials are used for the successively arranged pot-shaped cavities. Dornier exploited these advantages for the HERA cavities, which are made of nobium metal that becomes superconductive at a temperature of 264°C and allows accelerator field intensities above 5 MV/m (copper 1 megavolt/meter). In cooperation with the Hamburg scientists Dornier developed new manufacturing processes to produce the four-cell niobium resonators and the surrounding cryostatic temperature regulators. Two four-cell cavities are housed in a cryostatic temperature regulator unit which is filled with liquid helium (269°C). A multitude of production control phases is required for maintaining the high quality requirements, for it is possible to determine only after completion of the entire system whether a cavity was actually flawlessly produced.

In the course of this experimentation it was possible to work out a number of future-oriented technical developments. Thus, a method was discovered, for example, for largely substituting the highly expensive niobium, by applying a thin niobium layer on the surface of copper resonators. New processes in vacuum and insulation technology led to savings in the consumption of expensive liquid helium. The same is true for the modern cryostatic regulating technology which represents a precondition for the use of future energy sources such as liquid hydrogen in future transportation facilities.

The new accelerator technology with the 16 superconductive resonators by Dornier offers in HERA, in addition to the enhancement of electron energy, the option of gaining substantial operational experience with superconductive acceleration courses. This in turn creates the prerequisites necessary for using superconductive resonators to an even greater measure in future accelerator projects.

MICROELECTRONICS

GDR: Reorientation of Microelectronics Industry Proposed

90WS0061A East Berlin RADIO FERNSEHEN ELEKTRONIK in German May 90 pp 279-281

[Article by Wolfgang Marschall, Ph.D.: "The GDR's Microelectronics Industry—What Direction?"]

[Text] In the aftermath of the GDR's political reorientation and economic reform, many economic and political positions, priorities and premises, heretofore taboo, are being challenged. And the microelectronics industry is not exempt from such critical evaluation. This is sound and appropriate. However, it does imply the danger of attributing mistakes which were made actually in the environs of the development of the microelectronics industry to the microelectronics industry itself. Hence assertions are being put forth that the microelectronics industry bears the primary responsibility for the desolate condition of many of the GDR's traditional economic sectors, that it usurped "all" investments, and that it is a bottomless pit. Such views are often associated subliminally with the belief that it is high time that the microelectronics industry in the GDR be dismantled and that appropriate technologies and technical processes be imported.

In a magazine such as "radio fernsehen elektronik" it is hardly necessary to prepare an elaborate rationalization in favor of microelectronics. Many readers identify with its scientific-technical progress, the most dynamic of our times; they relate to the development and direction of technical processes and technologies which have left a lasting mark on, and vigorously demand the perfection of, the sum-total system of productive forces.

What is especially relevant in this context is the fact that the microelectronics industry constitutes a technical development that is in a position to significantly affect economic, ecological, and social progress. Indeed, microelectronics and related forms of information technology have a profound influence on our capability to generate super-sensitive automatic control systems, to render technology safer, to reduce its size, and to turn technology into a universal resource for mankind. Hence, the microelectronics industry is not only a fundamental ingredient of technological progress, but it also forms an important cornerstone for society's progress. It is thus essential that in the implementation of economic reform, there will be deliberations on how the microelectronic foundation in the GDR will be fashioned and how its development and exploitation will be effected in the factories and institutions.

The GDR's Microelectronics Industry on the Doorstep of the 1990s

When considering the benefits of microelectronic technologies in the GDR and the related problems that require solutions, one should start out with the following observations:

- The GDR has its own independent microelectronic base. The GDR has the capability to produce highly and super-highly integrated components, modern equipment and secondary materials and is in a position to generate important applications.
- In the GDR, there exists a qualified pool of scientists, engineers, technical experts and managers with experience in high technology processes.
- The microelectronics industry in the GDR serves as a powerful partner for the national economy and for the international division of labor.

At the same time, we must recognize that during the 1980s, the GDR did not redress her existing technical and technological gap relative to the international state-of-the art. With respect to components, this gap is 3 to 8 years, with respect to many applications it is as high as 10 to 12 years. Hence, the exploitation of the input into the microelectronics sector has been pressed into an economic framework within which the reproduction of the input does not result as comprehensively or as swiftly as is the case in the international arena. The economic lag in the GDR's microelectronic industry was unable to achieve an appropriate minimum output. However, the causes for this are not solely attributable to deficiencies in the microelectronics area. It is not possible to arrive at a comprehensive explanation unless the sum-total societal correlations are taken into account. These correlations are primarily due to the fact that the GDR's microelectronics sector was developed such so as to achieve a high degree of self-sufficiency and that it was placed on too broad a base. Furthermore, international division of labor and cooperation have not been achieved to the degree as in the international trading community. Without a doubt, embargoes imposed by the governments of leading Western industrialized countries have played a crucial role in this development. Also, the all-but-total failure of COMECON, especially in the field of microelectronics, has contributed to the GDR's exaggerated go-it-alone attitude. However, it would be fallacious for the GDR to look for the cause of its problems exclusively outside its own economic system. The fact remains that it is highly unlikely that the GDR, given its previous system of central planning and government control, would have been in a position to enter into international relations of true cooperation and to make meaningful contributions to solving the problems of the international division of labor. Certainly, an additional fundamental stumbling block for the microelectronics sector was the fact that at the end of the 1970s, the forced expansion of the microelectronics base was initiated while fundamental reform of the traditional production structures did not take place. This meant essentially that

the microelectronics sector was thrust upon the existing economy. In so doing, resources were shifted away from the traditional industry sectors by fiat, where they were needed and where they had been generated in the first place, and poured into the microelectronics sector, among others (by all means, not into the microelectronics industry alone, but also into the super-extensive expansion of a national energy base and other sectors). Causes and effects are thus closely interwoven in a complex web.

Also, a much too broad and disjointed product palette was and is being developed and produced on the basis of the go-it-alone attempt, involving mostly small-scale serial production at costs that are higher by a factor of ten when compared to the international average. Subsidies for the manufacture of components and an extremely low foreign currency earnings coefficient from the sale of electronics products are illustrative of this fact.

In all certainty it will be necessary to establish in further detail the reasons for the causes of such high cost factors. For example, to what degree are overhead costs, which are known to be very high in the GDR, contribute to the high cost factor? Is the expensive and circuitous route to acquiring Western technologies, listed in the COCOM catalogs a relevant cost factor? To what extent is the evaluation by the factor 4.4 of Western imports justified and in what way does it distort the cost situation? At this time, we are unable to resolve these questions. It is difficult to provide a realistic assessment of the actual cost progression given the excessively distorted development of cost accounting and price formation over all these years, and to eradicate mistakes in a methodical and systematic fashion. However, there should be little quarreling about the claim that efficiency must be low given the following facts: a significant gap in technical and technological R&D; extremely small-scale serial production; and conspicuous shortcomings in mastering technology, especially in the start-up phases of new production processes which, in turn, result in comparatively low yields and often in poor product quality. Hence, the conclusion appears justified that, on a national economic scale, the total process in manufacturing and reproducing microelectronics has not resulted in a strong and broad mass production of goods. It must be pointed out in this context that with respect to individual processing steps, major savings and substitution effects enter into the picture. However, they are counteracted by decreased efficiency or low foreign currency earnings from the export of finished products which, in turn, results in an insufficiently overall positive efficiency balance. To put it more bluntly: So far, the are not guarantees on the horizon, that the GDR's economy will be in a position to derive a large enough benefit from the manufacture and application of microelectronic technologies, say in the year 1990, to produce in the same year those inputs required for the future developments and productions of microelectronic technologies. Solving this problem in light of the brisk pace of developments and the rapidly increasing input requirements is an extremely challenging task. And it is imperative that this task be tackled within the framework of the current economic reform process.

New Economic Standards

The claim that the electronics cooperatives are operating self-sufficiently and are selling their products at a profit is questionable at best given the heavy subsidies poured into the components sector. To be sure, there is no country in the world where the microelectronics industry does not receive government subsidies. And this is true for the microelectronics industry in the GDR. However, subsidizing research and investments through tax revenues generally lead to self-sustained production processes without the need for further and prolonged subsidies. So far, this requirement has not been met in the GDR. Despite the government's investments in research, substantial subsidies were required up until 1989 to "make up" for low efficiency in the manufacture of components; and these subsidies are not compensated for by benefits derived from research application or from the export of finished electronics products.

Although it appears at first glance that this harsh evaluation of the economics of the microelectronics industry argues in favor of dismantling the industry, in reality it is a plea to preserve it. By now, it must have become crystal clear what the microelectronics sector can accomplish and what must be done to reach this goal. Namely, emphasis must be placed on positioning the microelectronics sector of the GDR into a new societal setting and environment. The current economic troubles of the microelectronics industry are not the result of deficient performance on the part of electronics experts (even though there is certainly room for improvement here), but the fallout from a societal environment in which the industry in effect was pre-programmed to perform inefficiently. And in this environment, the "comprehensive intensification" was coupled to a high degree with extensive measures and, ultimately, with declining rates of increases in efficiency. Supplying customers with components, from a national production base if possible, was the declared goal superceding the requirement for efficiency. In the future, it will be vital to place emphasis squarely on efficiency with respect to the entire mass production process, development, manufacture and applications in the microelectronics industry and to achieve an international level of cooperation and competition. In reaching this goal, we will be able to supply our national economy with a sustained production of components and equipment and, through imports, with those electronics parts not manufactured at home. To the degree that East German cooperatives and factories are actually retooled to produce their own inputs for purposes of broadening the manufacturing base, to the degree that new business entities and new forms of ownership become established, to the degree that the production process is geared to serving the marketplace and to meeting the test of the marketplace, hence, to the degree the protective, but controlling, influence of the

state is removed, it is essential that all factories, cooperatives and production complexes become economically productive or otherwise perish at the hand of the competition.

To put it plainly, there will certainly be state subsidies to promote the microelectronics industry, perhaps even the computer, telecommunications and automation sectors. This serves the purpose to rapidly, and with reasonable expenditures, rally national capabilities which will be capable of competing internationally.

Everything else, including the implementation of production, sound production criteria, the product palette, imports and exports, as well as the output of the actual product must meet the tests of the market and must be commensurate with the input to a high degree. And it is the producer collectives who must bear the responsibility for these decisions. This requirement applies not only to joint ventures, private corporations or other new forms of business organization and ownership, but also to collective property. How could it otherwise maintain its leading position in society if it is not held to the same standards of efficiency? Furthermore, aligning itself with the demands of the marketplace does not jeopardize the social interests of the working population. On the contrary, this forms a vital foundation for prolonged and sustained social progress which is only able to unfold itself on the foundation of vigorous economic performance. These high economic requirements and standards will determine the development of the microelectronics industry and will significantly define its profile in the 1990s. The better everyone adjusts to the changes in a timely and conscious manner the better the chances will be for expanding the East German microelectronics sector in the '90s so it may take its place in the production process whose efficiency it will have promoted.

What Strategies?

Based on the new economic standards to which the GDR's microelectronics industry will have to adapt, the following presents several strategies which are of vital importance for the economic improvement of the microelectronics sector:

- The role of the international division of labor within the framework of new dimensions and new forms of organization whereby the old dominant focus should be shifted away from COMECON and instead reoriented to seek out new possibilities for close cooperation with Western manufacturers, especially in the FRG. The overall goal is to align the GDR's electronics sector with an efficient and competitive European electronics capability. Such an alignment of the heretofore inflexible and comparatively inefficient electronics capabilities of the COMECON member countries with a pan-European one would constitute an important step in presenting Japan and the United States, the currently dominant players in the electronics arena, with an appropriate counterbalance and to shift the competitive situation in favor of all of Europe. This would enable the economically weaker Eastern European countries to participate in an accelerated development pace and in significant performance progress. Currently, the GDR has an above average level of development within the COMECON framework. If the GDR's restructuring processes are handled in a timely and prudent fashion, it would place it in a good position to play the intermediary between the EC and COMECON, thus making a positive contribution to the processing of inputs. As a result of political and economic reforms in the COMECON member countries, the current situation is conducive to put such concepts into reality. Such new forms of cooperation are now possible because of new forms of mixed ownership, foreign investments and capital imports as well as the attempts, though still in their infancy but nevertheless across-the-board, by manufacturers to meet the test of the marketplace. There are a number of examples for this, even though not as yet in the components sector. To the degree that such new cooperative relations become established and to the degree that strategic objections to the export of high technologies into socialist countries are attenuated, new solutions are certain to be found for the components industry as well. Under these circumstances it might be realistic to aim, by the mid-1990s and with the cooperation of the EC and possibly with the COMECON partners, at building an efficient component production at a technology level of 5 or even 6. Such an endeavor, possibly as an immediate follow-on to the Jessi Project, would permit the freeing up of capacities in Western Europe at technology levels 7 and 8. It would be feasible to provide European consumers with products from the GDR. Of course, this endeavor would require much higher production standards than currently exist in the GDR. To this end, familiarity with the relevant technology and a high production output, top quality and low costs as well as flexible delivery systems are essential prerequisites. The existing conditions in the GDR bode well for putting such objectives into reality. Inasmuch as Czechoslovakia, the Soviet Union and other COMECON countries would make a contribution as parallel and ancillary producers, it would speed up the pace and enhance the effectiveness of such a development. Plant and equipment to be built would form the foundation, say by the year 2000, for the production of high-performance memory chips, processor circuits and ASICs, for speeding up the electronics development significantly in the participating national economies and to improve its economic efficiency profoundly. By joining participants of the Jessi Project, e.g., Siemens and Philips, the GDR would start gaining access to state-of-the-art components. To round off such a strategy, adequate objectives for the areas of application, including mechanical engineering, are of supreme importance. This means that processing requirements in the areas of electronics and mechanical engineering must be improved to such a degree so as to comply with international standards.

- Clearly defined objectives for national development emphases for applications in the microelectronics industry. All in all, it is important to correct the excessive production structures and to refocus our attention to specific areas. In this connection, it would make sense to determine vertical production structures in the computer, telecommunications and automation sectors which utilize the same type of inputs, thereby guaranteeing a complex process. It is desirable that such processes require only low material and energy inputs but are characterized by high intelligence. These requirements are more than met by the GDR's scientific equipment manufacturing industry, the electrical engineering sector but also sophisticated branches of the mechanical engineering industry, e.g., Textima, Polygraph, Nagema, or the machine tool building industry. As is true for the restructuring of the components building industry, here too it will not suffice to simply set national performance goals and to be satisfied with our own national progress. Rather, it is essential to achieve such performance standards that best utilize and process production inputs. This means that entire technology and product systems must be elevated to a higher level so as to meet progressive international standards and to guarantee competitiveness as well as flexible delivery structures. As mentioned earlier, it is quite apparent that the utilization of production inputs currently is hampered not only by obvious deficiencies in certain technical and technological areas but even more so by the inadequate economic framework for top efficient production. It is easy to see that a restructuring of the electronics/mechanical engineering complex is best achieved by tackling analog objectives in the components industry within the framework of international division of labor. Furthermore, it will be essential to correct the East German industry's domestic structures in favor of such restructuring. Existing capabilities utilizing outdated technologies, which are very material and energy intensive, import most inputs and do not upgrade them significantly, and then re-export them without many benefits for the national economy, such capabilities use up a lot of potential and restrict overall economic growth. Such capabilities must be reoriented toward more progressive production structures. Similar tendencies have been observed in the FRG and other EC member states for years. Such restructuring processes make an important contribution to freeing up essential capabilities for the microelectronics industry and to creating conditions for increased efficiency within the national economy, thus enhancing the possibilities of the microelectronics sector.
- Development of all internal efficiency reserves in the electronics industry, in research institutions and in the factories. Past experience clearly demonstrates that despite respectable progress within the microelectronics industry, the GDR has yet to meet international performance standards. This is especially evident when comparing the factor labor input for the performance of similar tasks. This is not a particular characteristic of the microelectronics industry alone but is symptomatic of all research institutions and factories in Eastern Bloc countries. Obviously, this symptom constitutes a typical attribute of an overall inefficient system of central planning and management. Ultimately, the system leads to a significant squandering of labor, materials and resources. Hence, it is essential that in the future, production requirements within the framework of the national economy as well as the individual production sectors are changed such so as to meet international performance standards.

It is important to:

- Pursue a balanced development of the material-technological foundation in line with appropriate international standards.
- Guarantee the adequate utilization of the domestic labor force and international cooperation, especially with a view toward ensuring that all research and production processes are provided with the necessary materials, etc. Currently, a far too high percentage of the labor force is expended on bridging supply gaps, to overcoming bureaucratic hurdles and on dealing with bottlenecks.
- Seek the implementation of the performance principle not only with a view toward satisfaction of material needs but also with a view toward engendering performance conditions that promote creativity.

The thoughts outlined above purposefully did not focus exclusively on technical and technological strategies and objectives. Many of the obvious problems in usefully employing production inputs in the microelectronics industry are not attributable to microelectronic-specific factors alone; their successful solution will only take place within the framework of societal and strategic objectives. In this context, technological emphasis constitutes an important element. However, it is insufficient to find long-term solutions and to make contributions to increasing productivity.

The tasks outlined for the GDR's microelectronics industry must be tackled under all circumstances, even if the two countries are reunified during the 1990s and the GDR will cease to exist.

TECHNOLOGY TRANSFER

Hungarian Firm Founded To Serve as Technology Bridge To Soviets

25020017A Budapest COMPUTERWORLD/ SZAMITASTECHNIKA in Hungarian 5 Apr 90 p 5

[Article by Zsuzsa Szekeres: "A Company With Three Legs is Born; ERFI Partners East and West"]

[Excerpts] The Electronics Development Enterprise, ERFI, founded a joint stock company with Soviet, Hungarian and West European partners at the end of

March. What is the advantage of such a partnership, for the time being so unusual? We asked Pal Vadaszy, director of ERFI, and Denes Solnay, deputy technical director, about this.

We learned that they took this step within the framework of the reprivatization program. They overcame their deficit status year before last and were profitable in 1989 so they felt that they did not lack money for successful operations. It is true that they did need capital, because the great majority of Hungarian enterprises are struggling with liquidity problems. [Passage omitted]

Beginning in 1992 trade between the Soviet Union and Hungary will use dollar accounting and they had to prepare for this. And it would be worth while to exploit Western interest in the Soviet Union, so partners in the mixed enterprise being formed represent both sides.

ERFI is a research and development firm. It produces only on an experimental basis and has no series manufacture. They do not intend to change this. [Passage omitted]

According to their plans the company will be a bridge between East and West. For example, if there is a need in the Soviet Union for reconstruction of a rolling mill or use of robotics or power electronics it is not certain that ERFI could satisfy this with its own production, but it is certain that it could get into the deal with its intellectual capital. It could work the other way. In the recent past they developed in the Soviet Union a small laser head for which ERFI provided the design, the marketing and the microprocessor control, so they can produce an item which is competitive in the West. There could also be cases in which the Hungarian party takes the initiative. [Passage omitted]

In the new company ERFI will deal with the developments and products it has had success with thus far—power electronics, computer regulated idle compensators (these reduce the idle power losses in plants which is significant partly for energy conservation reasons), computer applications (meaning everything in this area but primarily CAD/CAM and mechatronics), telecommunications peripherals, infra and video technology and the development of property protection devices. We should make special mention of mechatronics, the chief areas of which are industrial weight and force measurements, control of unique technological processes, transportation electronic data collection, preparation of user oriented control software and supplemental automation, meaning the renovation of physically acceptable machinery. [Passage omitted]

The planned base capital for the new company is about 120 million forints. The foreign partners will provide about a third of this. So far there is no public information about who is involved. [Passage omitted]

Hungarians Reorient Research, Development Toward West

25020017B Budapest COMPUTERWORLD/ SZAMITASTECHNIKA in Hungarian 17 May 90 p 5

[Article by Katalin Magos: "A Turnaround in Our R and D Policy?"]

[Text] The old technical development policy oriented toward isolation and the East European "market" view is no longer suitable for solving the new research and development tasks coming up as a result of the opening. So a reorientation has begun, toward the West instead of the East. This is shown by the fact that in March, at Hungarian initiative, a technical-scientific subcommittee was formed within the framework of the European Community-Hungarian mixed committee to aid linking domestic research institutes and enterprises into Western European R and D programs.

At a briefing at the National Technical Development Committee (OMFB) acting chairman Frigyes Geleji talked about the new possibilities and said that so far Hungary cannot officially participate in the COST program aimed at scientific-technical cooperation but the situation is expected to change as a result of political changes. Until then we must try to build from below for domestic institutes can compete for some projects even now, although they must count on some resistance.

It is easier for us to gain admission into the EUREKA program. Knowing this the OMFB, jointly with the industrial and trade ministries, announced a competition last year to support domestic institutions joining in the program. Fifty-four Hungarian institutions applied but only eleven of them—including two themes offered by the Budapest Technical University, computerized speech processing and integrated optical technology—satisfied the requirements and so can be admitted in principle into one or another of the more than 400 projects of EUREKA. However, they will get support from the 60 million forints set aside for this purpose only when their actual joining is certified.

In regard to the PHARE program aiding reconstruction of the Hungarian and Polish economies our country is receiving support primarily for structural change, environmental protection, agriculture and expert training. Frigyes Geleji said that with the program they want to support, among other things, repair of the delapidated domestic research and development network, the development of informatics systems, further development of the IIF [the national research and development computer network] and the acquisition of testing systems to improve quality.

The Technical Information Office (MII) of the OMIKK [National Technical Information Center and Library] has developed a database about R and D programs of the European Community which can be accessed via the IIF and the computer system of the MII itself.

Hungarians Prepare To Manufacture Western Telephone Exchanges

25020017C Budapest COMPUTERWORLD/ SZAMITASTECHNIKA in Hungarian 7 Jun 90 p 4

[Article by Janos Andor Vertes: "Everything Is Possible!"]

[Excerpts] There is a new commodity on the investment goods market—the Videoton Radio Factory no longer advertises its products but rather its free capacity. This commodity is measured in tons per year or hours per year and is intended to attract the interest of manufacturers of precision engineering cut metal parts or parts made with high pressure aluminum casting and precision casting.

Hopefully the Videoton SEL Telecommunications Engineering Corporation, formed on 23 October last year (the freedom holiday, the day the republic was proclaimed), will not have to offer its capacity the same way. The planned capacity is not small. The plan calls for exchanges capable of handling 100,000 telephone lines by 1991 and 300,000 telephone lines by 1993-1994, representing trade worth 150 million marks. The goal of the German-Hungarian mixed enterprise is manufacture of the System 12 telecommunications system, used in thirty countries of the world, but to fully exploit capacity they must win those Hungarian state orders for which there has been such a scramble in recent months.

System 12, in the development of which the mixed enterprise partner Standard Elektrik Lorenz played a determining role, is a completely digital switching exchange system. [Passage omitted]

Videoton has made good use of the freedom to reorganize. The former Electronics Enterprise now consists of 19 enterprises operating under the name Videoton Group. The group chose a group as a partner for the renovation of the informatics branch. At the beginning of this year the transnational Bull Group became the foreign owner of Hungarian-French-Informatics Ltd; Bull does more than 400 billion forints trade per year. [Passage omitted]

The Videoton Automatics Joint Enterprise has an old new partner, Dataproducts, which provided a license for the manufacture of line printeres by Videoton in the early 1970's. Last year Videoton Automatics was the most profitable enterprise of the group but this year it is struggling with difficulties; in vain was it among the first to introduce the Comprehensive Quality Control System, in vain does it stand alone on the market of CEMA countries in robotics and line printer manufacture if these markets are shrinking so much today—not least of all due to government restrictions. [Passage omitted]

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